DOCUMENT RESUME

ED 218 428 CE 031 218

AUTHOR Goodson, Ludy
TITLE Engine Tune-Up Service. Unit 5: Fuel and Carburetion Systems. Review Exercise Book. Automotive Mechanics Curriculum.
INSTITUTION Florida State Univ., Tallahassee. Career Education Center.
SPONS AGENCY Florida State Dept. of Education, Tallahassee. Div. of Vocational Education.
PUB DATE Apr 78
NOTE 141p.; For related documents see CE 031 208-222 and CE 033 108-109.

EDRS PRICE MF01/PC06 Plus Postage.
DESCRIPTORS *Auto Mechanics; Check Lists; *Engines; Evaluation Criteria; *Fuels; *Motor Vehicles; Postsecondary Education; Pretests Posttests; Review (Reexamination); Secondary Education; Study Guides; *Trade and Industrial Education
IDENTIFIERS *Automotive Fuel Systems; *Automotive Tune Up; Carburetion System; Carburetors

ABSTRACT

This book of pretests and review exercises is designed to accompany the Engine Tune-Up Service Student Guide for Unit 5, Fuel and Carburetion Systems, available separately as CE 031 217. Focus of the exercises and pretests is inspecting and servicing the fuel and carburetion systems. Pretests and performance checklists are provided for each of the ten performance objectives contained in the unit. There are 25 review exercises that are short check-ups to let the student know how well she/he has learned the material for one or more work activities covered in the Student Guide. Answers to all of the exercises are found at the back of the book. (YLB)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED218428

ENGINE TUNE-UP SERVICE

Unit 5: Fuel and Carburetion Systems

Review Exercise Book

Automotive Mechanics Curriculum

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

This document has been reproduced as received from the person or organization originating it.

Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

David McQuat

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

CE 031 218

State of Florida
DEPARTMENT OF EDUCATION
Ralph D. Turlington, Commissioner of Education
Tallahassee, Florida

An equal opportunity employer • ***Division of Vocational Education*** • April, 1978

Instructional Development: Ludy Goodson
Content and Instructional Review: Theodore R. May, Roger Richardson
Editing: Melissa M. Wheeler
Graphic Design: John S. Matlock
Copyright: Marsha T. Paddock

HOW TO USE THIS BOOK

In this Review Exercise Book you'll find pretests and review exercises. These tests and exercises cover the material in the Student Guide. The Student Guide will tell you when to do a review exercise, so don't start doing any of these exercises just yet.

PRETESTS

You will take the first pretest for Performance Objective 23 after you read the introduction to Unit 5. A pretest is a test designed to help you and your instructor find out what you already know. The questions on the pretest may also be used to help you review what you've learned after studying the material and doing the activities.

REVIEW EXERCISES

A review exercise is a short check-up that lets you know how well you've learned the material for one or more work activities covered in the Student Guide. It is a way of testing yourself. The back of this book contains the answers to all the exercises. You might be tempted to turn to the answers before you complete the questions, but if you do, you'll be the loser—for two reasons. In the first place, automotive mechanics is a skilled and dangerous trade. You need to know what you're doing and how to do it safely without having to check the book on every step. If you don't learn the material well, you can hurt yourself or damage the vehicle. In the second place, you'll eventually be graded by your instructor on how well you can do a performance objective. So if you look at the answers first, you'll just be wasting your time.

After you answer all the questions in a review exercise, check your answers with the ones in the back of the book. Review the material in the Student Guide for any question you had trouble with. Talk with your instructor if you're still unsure about any of the material covered in the Student Guide.

FINAL TESTS

There are only two tests on which you'll be graded. One of the tests will be a written test, and the other will be a performance test. If you've studied the material in the Student Guide, and if you've done the exercises and work activities as required, you'll have no trouble doing well on these final tests. You may even find them easy and fun to complete.

P.O. 23 PRETEST

NAME _____

1. Check (✓) all the safety practices listed below that you should follow.

_____ a. Use fender covers when working under the hood.
_____ b. Use compressed air for cleaning paper air filter elements.
_____ c. Wear goggles when working with compressed air.
_____ d. Place the carburetor air cleaner housing on the floor when replacing air filter elements.

2. What is the most common type of carburetor air cleaner used in modern vehicles?

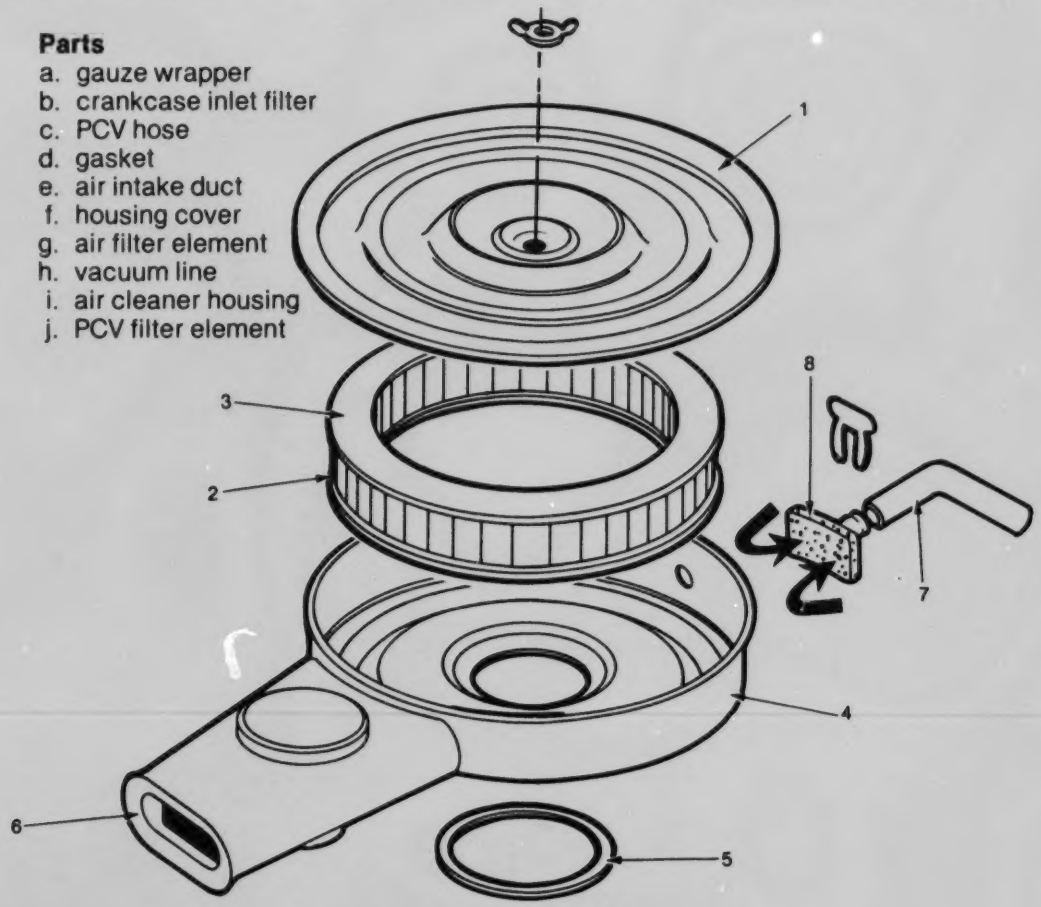
_____ a. polyurethane element
_____ b. paper filter element
_____ c. oil bath element
_____ d. gauze element

3. Identify each of the parts in the picture by writing the letter of the correct part name in the proper blank.

_____ 1.
_____ 2.
_____ 3.
_____ 4.
_____ 5.
_____ 6.
_____ 7.
_____ 8.

Parts

a. gauze wrapper
b. crankcase inlet filter
c. PCV hose
d. gasket
e. air intake duct
f. housing cover
g. air filter element
h. vacuum line
i. air cleaner housing
j. PCV filter element



4. Before removing the carburetor air cleaner assembly, you should:

_____ a. use tape to mark any hoses or lines to the assembly
_____ b. use compressed air to blow out the assembly
_____ c. remove the battery ground cable clamp
_____ d. tap the assembly a few times to loosen any dirt

5. The recommended procedure for servicing an oily paper filter element is to:

_____ a. replace the element with a new one
_____ b. soak the element in solvent and then allow it to dry
_____ c. blow the element clean with short bursts of compressed air
_____ d. tap the element against a hard, flat surface to clean it

6. The recommended procedure for servicing a dirty PCV filter element is to:

_____ a. replace the element with a new one
_____ b. soak the element in solvent and then allow it to dry
_____ c. blow the element clean with short bursts of compressed air
_____ d. tap the element against a hard, flat surface to clean it

7. The recommended procedure for servicing a dirty gauze wrapper is to:

_____ a. replace the wrapper with a new one
_____ b. soak the wrapper in solvent and then allow it to dry
_____ c. blow the wrapper clean with short bursts of compressed air
_____ d. tap the wrapper against a hard, flat surface to clean it

8. A polyurethane air filter should be cleaned by:

_____ a. using compressed air
_____ b. tapping it against a hard, flat surface
_____ c. soaking it in solvent

9. Check (✓) all the parts that must be removed before you can remove the PCV filter element.

_____ a. carburetor air filter element
_____ b. filter retainer clip
_____ c. air cleaner housing cover
_____ d. PCV hose and hose clamp
_____ e. vacuum line
_____ f. air cleaner assembly gasket

10. The steps for replacing a carburetor air filter element are listed out of order below. Write the letter of each step beside the proper number to show the correct sequence.

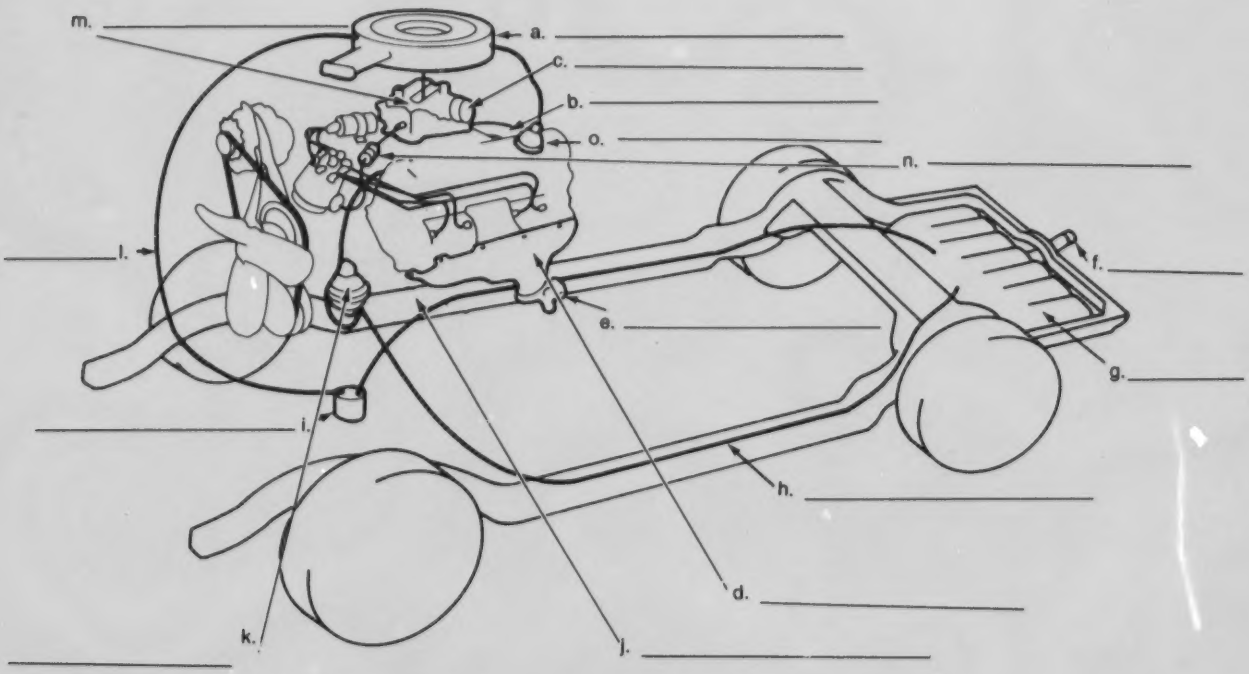
Order	Steps
_____ 1.	a. Place the gasket on the carburetor air horn.
_____ 2.	b. Place the gauze wrapper on the filter element.
_____ 3.	c. Install the air cleaner assembly housing cover and wing nut.
_____ 4.	d. Place the filter element in the housing.
_____ 5.	e. Install the air cleaner assembly housing onto the carburetor.
_____ 6.	f. Attach the vacuum lines, hoses, and ducts.

After you finish this pretest, carefully tear it out of the book and give it to your instructor. After s(he) has checked your answers, your instructor will direct you either to practice the work activities or to study the material covered by this test.

EXERCISE 1

1. Using the terms listed below, label the following diagram.

air cleaner
carburetor
choke
intake manifold
crankcase
exhaust manifold
manifold heat control valve
fuel filter
fuel tank
vacuum pressure fuel cap
fuel line
charcoal canister
canister vent line
fuel pump
PCV valve



Turn to the back of this book and check your answers for Exercise 1.

EXERCISE 2

1. Why is it important to filter the air before it goes through the carburetor to the engine?

_____

_____

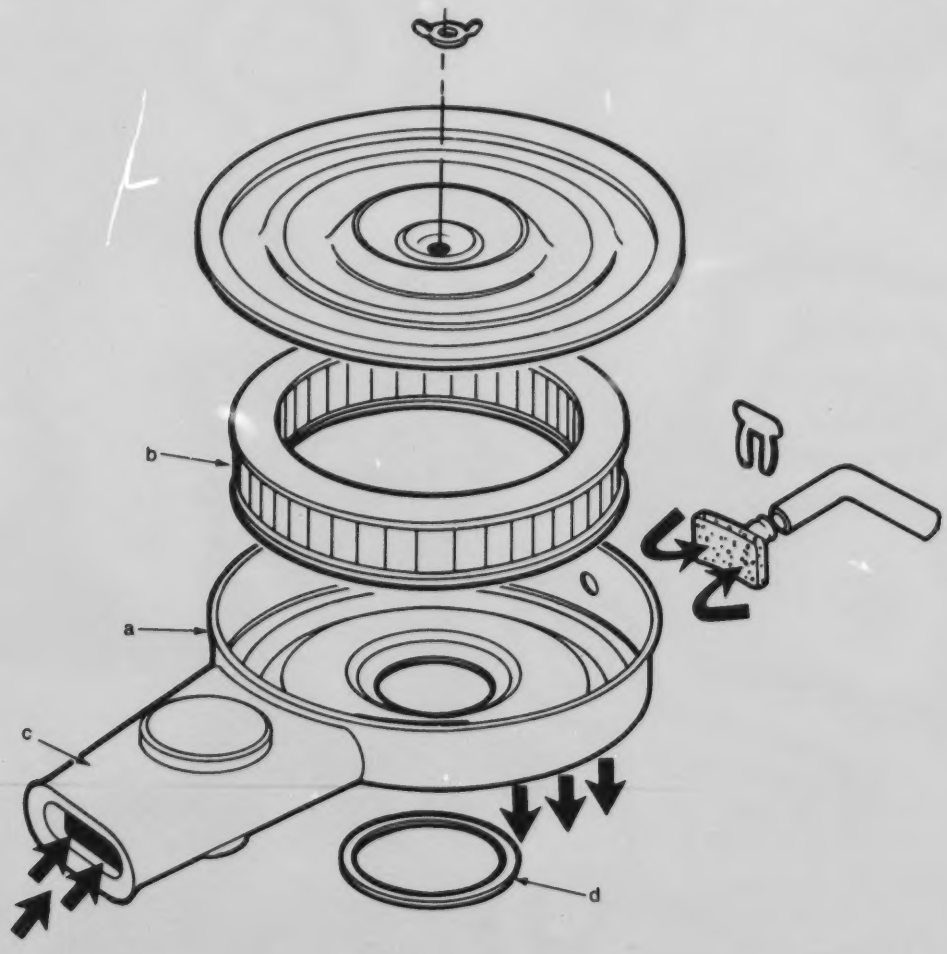
_____

_____

2. Label the parts of the carburetor air cleaner shown below.

a. _____ c. _____

b. _____ d. _____



3. What is an air duct?

_____

4. The newest and most common type of air filter element is the _____ _____ element.

5. Why shouldn't you use an air hose to clean a paper filter?

_____

6. Why should you place the air filter housing in a safe place after removing it? _____

_____

Turn to the back of this book and check your answers for Exercise 2.

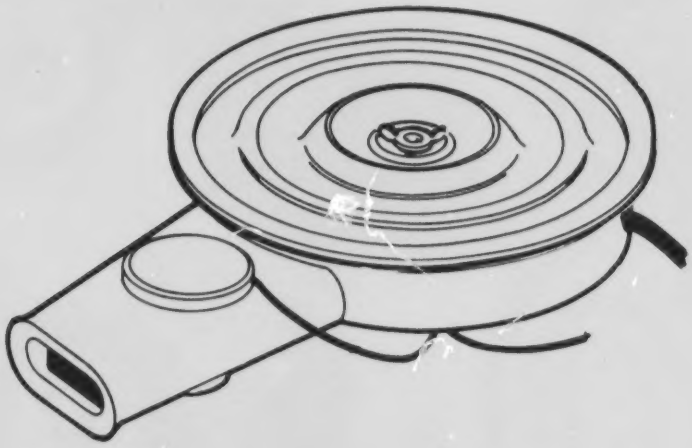
EXERCISE 3

1. What do you need to do to the carburetor air cleaner in this diagram before you can inspect it?

a. _____ d. _____

b. _____ e. _____

c. _____

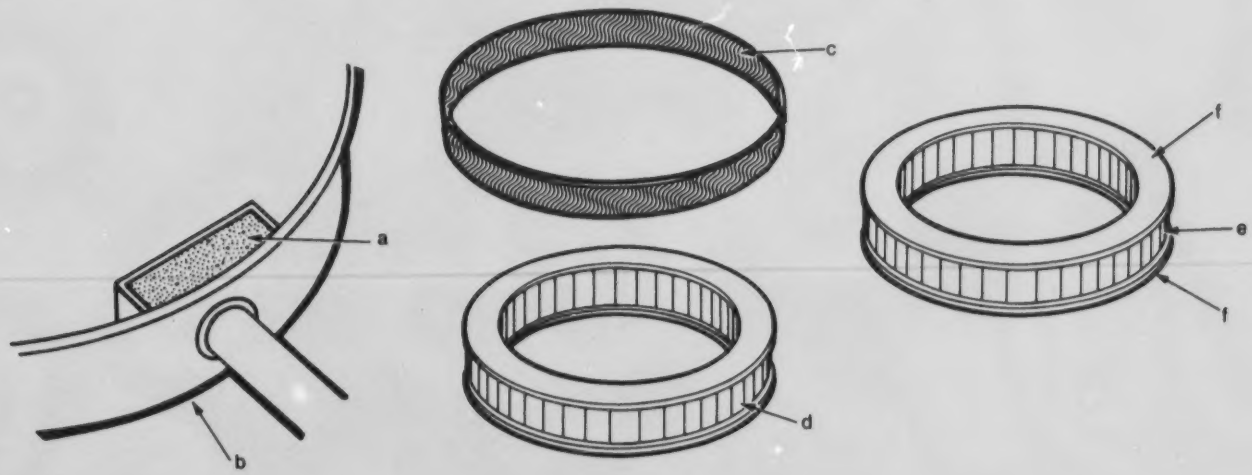


2. Label the parts indicated in the following three diagrams.

a. _____ d. _____

b. _____ e. _____

c. _____ f. _____



3. Which of the parts shown in the diagrams for Question 2 should be checked for dirt and dust?

_____

_____

4. For the statements below, write a T in the blank if the statement is true, or an F if the statement is false.

_____ a. If the paper filter element is wet with oil, it should be cleaned.

_____ b. If the gauze wrapper is dirty, it should be replaced.

_____ c. If the PCV element is dirty, it should be cleaned.

_____ d. If the paper filter element is dusty, it should be replaced.

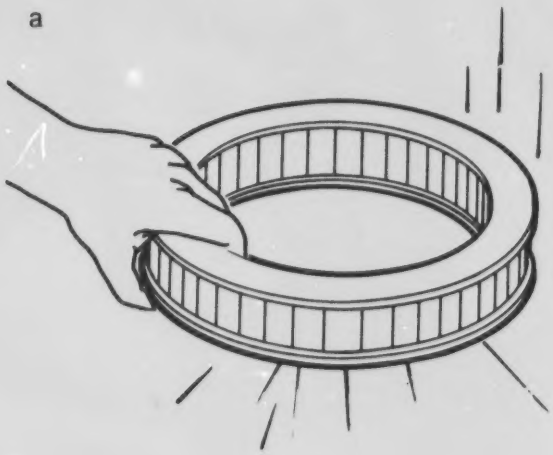
_____ e. If the carburetor air filter sealing edges are worn, the filter element should be replaced.

Turn to the back of this book and check your answers for Exercise 3.

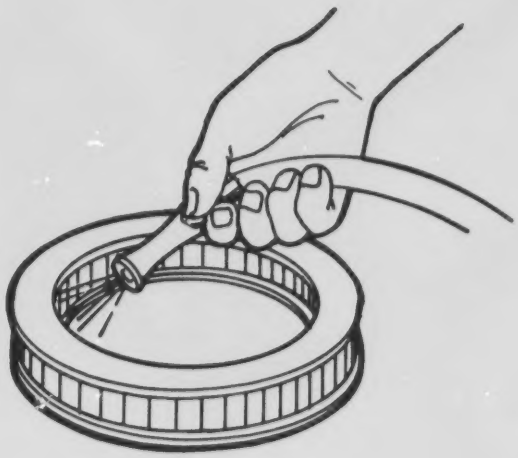
EXERCISE 4

1. The diagrams below show several ways to clean a paper air filter. Circle only the ***correct*** and ***safe*** way to clean the filter element.

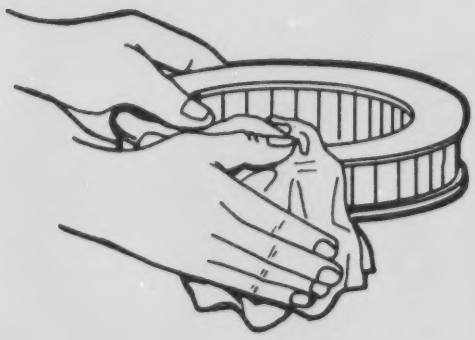
a



b



c



d

2. How should you clean a paper filter element?

_____

_____

12

3. Which parts of the carburetor air cleaner should be cleaned with solvent?

a. _____

b. _____

c. _____

4. Label each part indicated in the following diagram.

a. _____

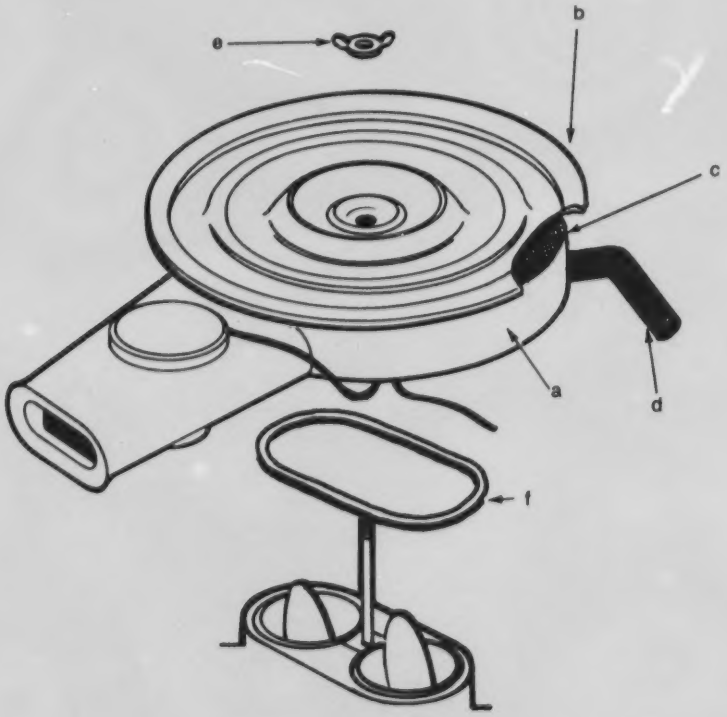
b. _____

c. _____

d. _____

e. _____

f. _____



13

5. To remove the PCV air filter, you would probably need to:

   a. remove the _____ from the hose

   b. remove the _____ connected to the PCV filter

   c. remove the _____ from the PCV filter

6. How would you install the PCV filter?

   _____

7. Where can you find out how to remove and replace the PCV air filter for the vehicle you are working on?

   _____

   _____

8. Complete the following steps for installing the complete carburetor air cleaner assembly.

   a. Replace the _____ (if there is one) in the air cleaner housing.

   b. Put the _____ back in the vehicle and reconnect the _____.

   c. Place the _____ back in the housing.

   d. Place the _____ back on top of the housing.

   e. Replace and tighten the _____ on top of the air cleaner assembly.

9. Answer the following questions, referring to the chart below as needed.

FILTER OR CLEANER	SERVICE INTERVAL (MILES)
PCV air filter	12,000
Air cleaner	30,000*

*Inspect and replace sooner if needed.

   a. When would the PCV air filter probably need to be replaced?

   _____

   b. When would the carburetor air filter element probably need to be replaced?

   _____

   c. How would you service the carburetor air cleaner?

   _____

Turn to the back of this book and check your answers for Exercise 4.

PERFORMANCE CHECKLIST—P.O. 23

The instructor will provide either a live vehicle or a live engine. Inspect and service the carburetor air cleaner and correct any problems you find. All of the performances below must be accomplished.

STUDENT PERFORMANCES

1. Removes carburetor air cleaner.
2. Removes carburetor air filter element, gauze wrapper (if so equipped), and PCV filter (if so equipped).
3. Inspects and cleans or replaces filter element(s) as necessary.
4. Inspects carburetor air cleaner assembly for defects.
5. Installs cleaned or new filter element(s).
6. Installs carburetor air cleaner assembly.
7. Uses proper tools and equipment.
8. Follows all appropriate safety precautions.
9. Performs tasks in an acceptable amount of time.

INSTRUCTOR RATINGS

ACCEPTABLE		NOT ACCEPTABLE		OMIT

Keep a copy of this checklist for your records.

P.O. 24 PRETEST

NAME _____

1. Check (✓) all the safety practices listed below that you should follow.
   - _____ a. Never aim a compressed air hose at another person.
   - _____ b. Keep flames and sparks away from the fuel system area.
   - _____ c. Lift the vehicle quickly when using hydraulic jacks.
   - _____ d. Never use a droplight when servicing the fuel system.
   - _____ e. Wear proper eye protection when you use compressed air.
   - _____ f. Always check the rated capacity of a lift before you raise a vehicle.

2. Which type of fuel filter must be replaced when it is dirty?
   - _____ a. a bronze filter element
   - _____ b. a paper filter element
   - _____ c. a ceramic filter element
   - _____ d. a wire mesh filter element

3. When servicing any fuel filter that is connected to flexible fuel lines, you should:
   - _____ a. plug the fuel lines after removing the filter
   - _____ b. first clean the fuel lines
   - _____ c. clamp the fuel lines before removing the filter
   - _____ d. first blow out the fuel lines with compressed air

4. Fuel filters located in the fuel tank are normally:
   - _____ a. replaced when the in-line fuel filters are replaced
   - _____ b. not replaced unless the fuel tank is removed
   - _____ c. cleaned and reinstalled every 12,000 miles or 12 months
   - _____ d. serviced during each major tune-up

5. When loosening a fuel fitting, what tool(s) are usually required?
   - _____ a. a flare-nut wrench
   - _____ b. vise-grip pliers and an open-end wrench
   - _____ c. an open-end wrench and a flare-nut wrench
   - _____ d. a box-end wrench and an open-end wrench

6. When installing a new in-line filter, you should make sure that:
   - _____ a. new clamps are also installed
   - _____ b. the filter is installed in the proper direction
   - _____ c. the air cleaner assembly is removed first
   - _____ d. the flexible fuel lines are plugged after the filter is removed

7. When installing a new fuel pump inlet filter, which attaches to the bottom of the fuel pump, you may need to:
   - _____ a. lift the vehicle for easier access
   - _____ b. remove the entire fuel pump
   - _____ c. remove the air cleaner assembly first
   - _____ d. clean the fuel pump bowl and inlet valve

8. The steps for removing and replacing an in-line fuel filter are listed out of order below. Write the letter of each step beside the proper number to show the correct sequence.

Order	Steps
_____ 1.	a. Clamp the new filter to the flexible fuel lines.
_____ 2.	b. Remove the old filter.
_____ 3.	c. Start the engine and check for leaks.
_____ 4.	d. Remove the clamps that secure the filter; then slide the clamps back onto
_____ 5.	the hose.
	e. Install the new filter in the correct position.

9. The steps for removing and replacing a carburetor inlet filter are listed out of order below. Write the letter of each step beside the proper number to show the correct sequence.

Order	Steps
_____ 1.	a. Install the air cleaner assembly.
_____ 2.	b. Using the proper tools, disconnect the fuel line at the carburetor.
_____ 3.	c. Install a new filter, gaskets, and spring.
_____ 4.	d. Remove the air cleaner assembly if necessary.
_____ 5.	e. Start the engine and check for leaks.
_____ 6.	f. Remove the gasket(s), filter, and spring.
_____ 7.	g. Attach the fuel line to the carburetor.

After you finish this pretest, carefully tear it out of the book and give it to your instructor. After s(he) has checked your answers, your instructor will direct you either to practice the work activities or to study the material covered by this test.

EXERCISE 5

For Questions 1-7, write a T in the blank if the statement is true, or an F if the statement is false.

1. _____ Hydraulic floor jacks should be operated slowly.
2. _____ Jack stands should be used with hydraulic floor jacks.
3. _____ Jack stands should be used to keep the vehicle from falling.
4. _____ It is safe to put any vehicle on a hydraulic lift.
5. _____ It is safe to rock a vehicle while it is on a hydraulic lift.
6. _____ It is safe to wear loosely hanging clothes and hair when working with equipment.
7. _____ It is safe to go without eye protection while working under a vehicle.

Tell why you should follow the safety practices listed below.

8. Never light a match, spark, or cigarette while working on the fuel system.

   _____

   _____

9. Clamp flexible fuel lines before disconnecting them.

   _____

   _____

10. Plug steel fuel lines after disconnecting them.

    _____

    _____

11. Avoid dropping the extension light while working on the fuel system.

    _____

    _____

12. When using a compressed air blow gun, you should:

    a. _____ point the blow gun at someone else

    b. always _____ the flow of air

    c. only use compressed air if _____ for the fuel filter you are working with

Turn to the back of this book and check your answers for Exercise 5.

EXERCISE 6

1. Use the following specifications to answer Questions a-c below.

FILTERS & CLEANERS

Filter or Cleaner	Service Interval (Miles)
Air Cleaner	①Replace 30,000
Fuel Filter (Pump Outlet)	②Replace 15,000
Crankcase Vent Filter (In Air Cleaner)	Replace 30,000

①Inspect, and replace if needed, at 15,000.

②Replace at 30,000 if in-line filter is also used.

a. What two types of fuel filters could you find in the vehicle? Where would you probably find them?

(1) _____

(2) _____

b. When should the in-line fuel filter be replaced for this vehicle?

(1) _____

OR

(2) _____

c. When should the outlet fuel filter be replaced for this vehicle?

(1) _____

OR

(2) _____

For Questions 2-4, select the answer that best completes the statement.

2. To remove the carburetor inlet filter, you will probably need to:

a. remove the crankcase ventilation filter
b. remove the air cleaner
c. tighten the fuel lines
d. wash out the filter

3. To replace any fuel filter, you should:

a. throw away the filter element
b. wash out the filter element
c. blow-dry the filter element
d. follow the directions for the filter or filter element

4. To remove a fuel filter in the fuel pump, you may need to:

a. lift the vehicle
b. burn the excess fuel
c. drain the fuel tank
d. drain the fuel pump

5. What should you do after replacing or reinstalling any fuel filter? Why?

_____

_____

6. How should you replace a fuel filter if you don't have access to a set of directions?

_____

_____

Turn to the back of this book and check your answers for Exercise 6.

PERFORMANCE CHECKLIST—P.O. 24

The instructor will provide a live vehicle or live engine. Inspect and service the fuel filters and correct any problems you find. All of the performances below must be accomplished.

STUDENT PERFORMANCES	INSTRUCTOR RATINGS		
	ACCEPTABLE	NOT ACCEPTABLE	OMIT
1. Removes carburetor air cleaner assembly.			
2. Disconnects fuel line at carburetor.			
3. Removes fuel inlet filter. Cleans or replaces as necessary.			
4. Installs fuel inlet filter and connects fuel line.			
5. Raises vehicle as necessary.			
6. Removes and checks fuel pump outlet filter.			
7. Cleans or replaces fuel pump outlet filter and installs.			
8. Lowers vehicle as necessary.			
9. Removes and checks in-line fuel filter.			
10. Cleans or replaces in-line fuel filter and installs.			
11. Installs carburetor air cleaner assembly.			
12. Performs operational test.			
13. Uses proper tools and equipment.			
14. Follows all appropriate safety precautions.			
15. Performs tasks in an acceptable amount of time.			

Keep a copy of this checklist for your records.

P.O. 25 PRETEST

NAME _____

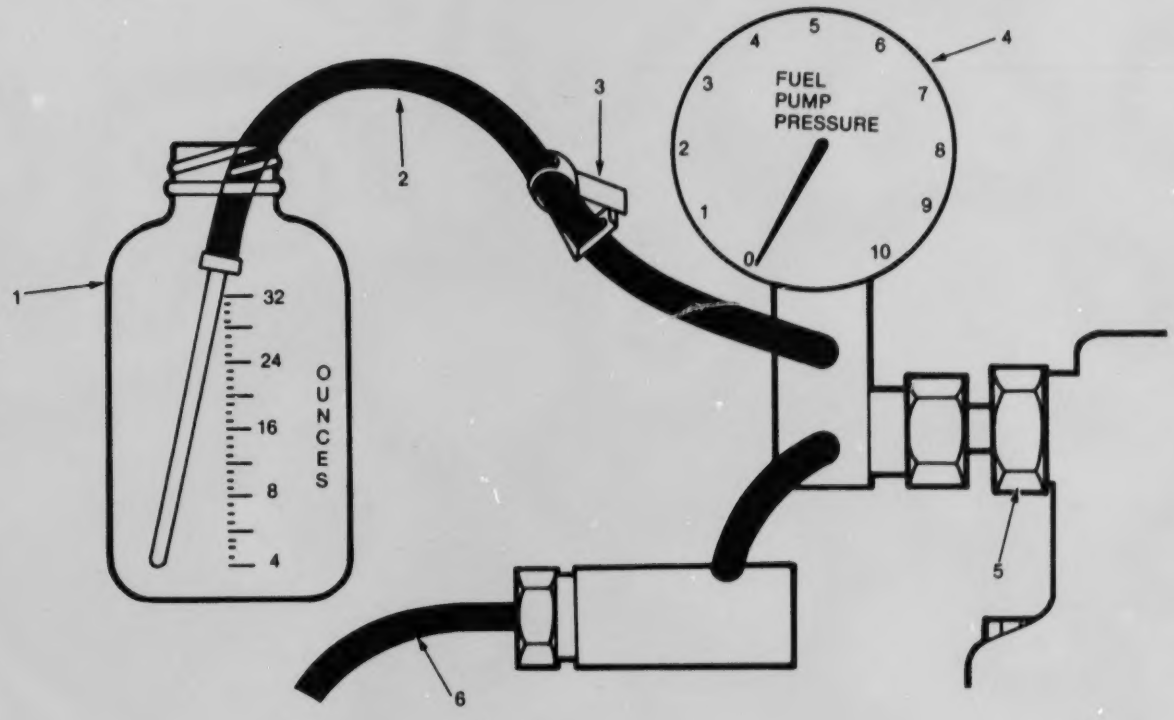
1. Check (✓) all the safety practices listed below that you should follow.
   - _____ a. Wear very loose clothing for ease of movement.
   - _____ b. Match fuel fitting threads squarely.
   - _____ c. Keep long hair under a hat.
   - _____ d. Never use a droplight when working with the fuel system.
   - _____ e. Use a flare-nut wrench on fuel fittings.
   - _____ f. Keep sparks or flames away from the engine compartment.

2. The results of the fuel pump volume test can be incorrect if:
   - _____ a. the fuel pump tester gauge is installed backwards
   - _____ b. the fuel pump is defective
   - _____ c. the fuel filter is defective
   - _____ d. the carburetor is defective

3. Which of these pieces of equipment is not required when making a fuel pump volume test?
   - _____ a. a container calibrated in fluid ounces
   - _____ b. adapters or T-fittings
   - _____ c. a fuel pump tester gauge
   - _____ d. a flexible fuel line

4. What is the recommended order of tests for the fuel pump?
   - _____ a. vacuum test, fuel flow test, fuel volume test
   - _____ b. fuel volume test, fuel flow test, fuel pressure test
   - _____ c. fuel pressure test, fuel flow test, vacuum test
   - _____ d. fuel volume test, fuel pressure test, vacuum test

5. Identify each of the parts shown below by writing the letter of the correct part name in the proper blank.



Parts

_____ 1. a. fuel line
_____ 2. b. vacuum tester gauge
_____ 3. c. calibrated container
_____ 4. d. hose clamp
_____ 5. e. fuel pressure gauge
_____ 6. f. flexible fuel line
g. fuel fitting adapter
h. fuel pump tester hose
i. carburetor fitting

6. Using the specifications listed below, check (✓) all the statements that would be true for a vehicle in good operating condition.

Fuel Pump	**Idle Speed**
Pressure. . . . . .3 1/2-5 lbs. at idle	Hot (slow) idle. . . . . .800 RPM
Volume. . . . . .1 quart in 1 minute at idle	Cold (fast) idle. . . . . .1900 RPM

_____ a. At 1900 RPM, the fuel pump should show 3 1/2-5 lbs. of vacuum.
_____ b. At 800 RPM, the fuel pump should pump at least 1 quart of fuel after 1 minute.
_____ c. At 800 RPM, the fuel pump should produce half the pressure (about 1 1/2-2 1/2 lbs.) specified for idle speed.
_____ d. At 1900 RPM, fuel pump pressure should be greater than fuel pump vacuum.
_____ e. At 800 RPM, the fuel flow pressure would be 3 1/2-5 lbs.

7. The steps for making a fuel pump volume test are listed out of order below. Write the letter of each step beside the proper number to show the correct sequence.

Order	Steps
_____ 1.	a. Hook up a tachometer to the engine.
_____ 2.	b. Clamp the hose and turn off the engine.
_____ 3.	c. Start the engine, set it at the specified RPM, and unclamp the hose for the specified time.
_____ 4.	
_____ 5.	d. Attach the fuel pump tester to the carburetor inlet.
_____ 6.	e. Compare the results to specifications.
_____ 7.	f. Clamp the volume hose and place it in a calibrated container.
_____ 8.	g. Obtain the manufacturer's specifications.
	h. Disconnect the fuel line at the carburetor, and install the adapter if necessary.

8. What would cause air bubbles to appear during a fuel pump volume test?

_____ a. a poor connection of the fuel pump tester gauge
_____ b. leaks in the fuel line
_____ c. a defective fuel pump
_____ d. excess vacuum in the fuel lines

9. During the fuel pump pressure test:

_____ a. the clamp is removed from the volume hose
_____ b. the clamp is left on the volume hose

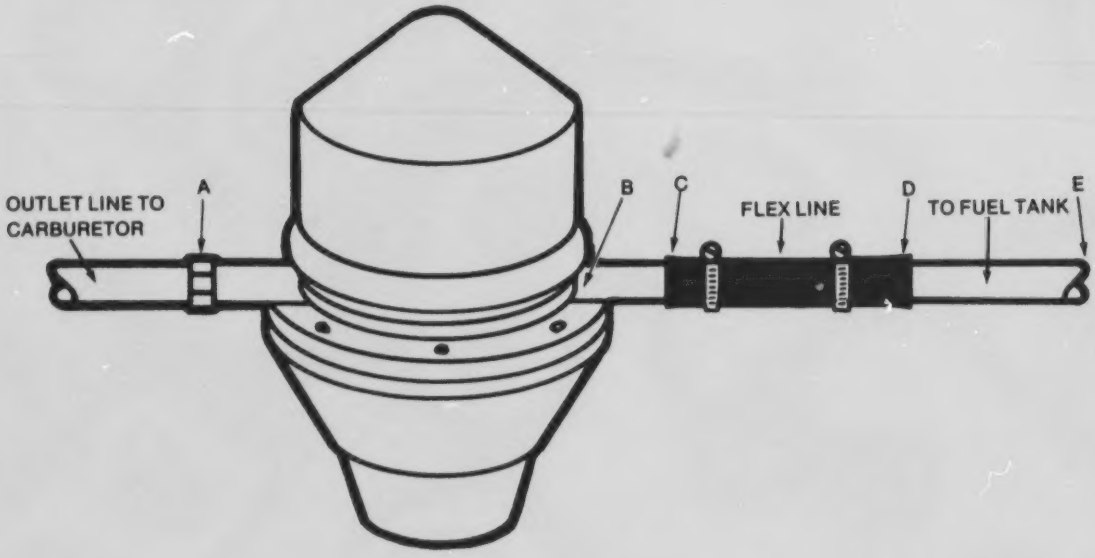
10. If your fuel pump volume test results were good, but the fuel pump pressure test results were bad, you should:

_____ a. replace the fuel pump
_____ b. check the fuel pump inlet lines
_____ c. check the fuel lines for leaks
_____ d. do all of the above

11. If your fuel pump volume test results were bad, but the fuel pump pressure test results were good, you should:

_____ a. check the fuel pump
_____ b. check the fuel pump inlet lines
_____ c. check the fuel lines for leaks
_____ d. do all of the above

Use this diagram to answer questions 12-14.



12. At what point in the diagram would you insert a vacuum gauge tester to make a vacuum test?

_____ a. Point A
_____ b. Point B
_____ c. Point C
_____ d. Point D
_____ e. Point E

13. At what point would you insert a vacuum gauge tester to directly check the fuel pump?

_____ a. Point A
_____ b. Point B
_____ c. Point C
_____ d. Point D
_____ e. Point E

14. At what point would you insert a vacuum gauge tester to check the entire fuel line to the fuel pump?

_____ a. Point A
_____ b. Point B
_____ c. Point C
_____ d. Point D
_____ e. Point E

15. A good reading on a fuel pump vacuum test is:

_____ a. 3-5 pounds and no drop when the engine is shut off
_____ b. 10-15 inches and no drop when the engine is shut off
_____ c. less than 3 pounds and a quick drop when the engine is shut off
_____ d. less than 10 inches and a quick drop when the engine is shut off

16. A good reading on the initial fuel pump vacuum test means:

_____ a. the fuel pump is defective
_____ b. the fuel pump is good
_____ c. the fuel line is defective
_____ d. the fuel pump valves and filter gaskets are good
_____ e. the flexible fuel line is defective

After you finish this pretest, carefully tear it out of the book and give it to your instructor. After s(he) has checked your answers, your instructor will direct you either to practice the work activities or to study the material covered by this test.

EXERCISE 7

1. What type of wrench should you use when connecting or disconnecting the fittings? _____

2. Why should you use this type of wrench on the fitting? _____

_____

3. What should you be careful to do when connecting fittings, so that you will not damage the threads? _____

_____

For Questions 4-7, write a T in the blank if the statement is true, or an F if the statement is false.

4. _____ It is safe to light a match or spark while working around fuel.

5. _____ It is safe to throw the droplight around or to drop it in a fuel mixture.

6. _____ It is okay to wear hair that is longer than conventional length if it is kept under a net or hat.

7. _____ It is okay to leave long shirttails hanging out.

8. The fuel flow or fuel pump volume test measures:
   - _____ a. the amount of fuel that can flow from the fuel pump to the carburetor when the engine is running at a specified RPM
   - _____ b. the amount of fuel and oil that flows from the carburetor to the engine
   - _____ c. the amount of fuel in the fuel filter when the engine is at idle RPM

9. Before measuring fuel flow, you should:
   - _____ a. check for fuel in the fuel tank and make sure the fuel filter is in good condition
   - _____ b. remove the fuel pump from the vehicle
   - _____ c. remove all fuel lines and hoses

10. To do the fuel pump volume test, you will need to:
    - _____ a. disconnect the fuel line at the carburetor fitting, connect the fuel pump test gauge to the carburetor adapter, and connect the fuel line to the fuel pump tester hose
    - _____ b. disconnect the fuel line at the carburetor fitting, connect the fuel line to the fuel pump, and connect the fuel pump tester hose to the carburetor fitting
    - _____ c. disconnect the fuel line at the fuel pump, connect the fuel pump tester gauge to the fuel pump, and put the fuel line in the volume container

11. During the fuel pump volume test, the clamp on the fuel pump volume hose should be:
    - _____ a. open at all times
    - _____ b. closed at the beginning of the test (before cranking the engine) and opened while the engine runs at the specified RPM
    - _____ c. open at the beginning of the test and closed while cranking the engine at the specified RPM

12. After recording the results of the fuel pump volume test, you should:

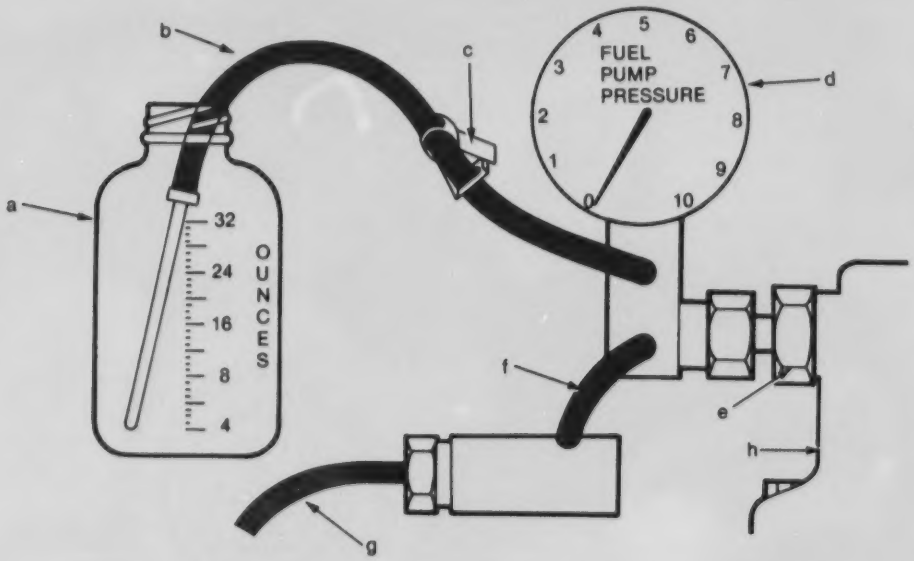
_____ a. compare the results of the fuel pump volume test to specifications and then do the fuel pump pressure test

_____ b. do the fuel pump pressure test and repeat the volume test if the pressure results are bad

_____ c. compare the results of the fuel pump volume test to specifications and not do the pressure test if the volume results are good

13. Label the parts shown in the diagram below. Use the following terms to help you label the diagram:

hose clamp
carburetor fitting
fuel inlet fitting
volume hose
fuel pump tester hose
fuel line
carburetor
fuel pump pressure gauge
container marked in fluid ounces



a. _____

b. _____

c. _____

d. _____

e. _____

f. _____

g. _____

h. _____

14. Use the following vehicle specifications as you answer the questions below.

IDLE SPEED	
LOW IDLE 500	**CURB IDLE** 550
FUEL PUMP	
Vehicle model—make volume test at idle RPM	
Volume.....One pint in 45 seconds	

a. How long should you let fuel flow into the container that is marked in fluid ounces? _____

b. How much fuel should be in the container at the end of the volume test?_____

c. At what RPM should the engine be running during the volume test?_____

d. Would a reading of 16 ounces on the container be good, or would it be too low?_____

e. Would a reading of 8 ounces on the container be good, or would it be too low? _____

Turn to the back of this book and check your answers for Exercise 7.

EXERCISE 8

1. The fuel pump pressure test measures:
   _____ a. the pounds of pressure in the fuel tank when the engine is at idle RPM
   _____ b. the pounds of pressure of the fuel when the engine is running at a specified RPM
   _____ c. the inches of pressure against the carburetor inlet valve at idle RPM

2. To do the fuel pump pressure test, you will need to:
   _____ a. check the specifications for the pump pressure test, crank the engine and run it at 1100 RPM, and check the reading on the container that is marked in liquid ounces
   _____ b. check the specifications for the fuel pump pressure test, crank the engine and run it at idle RPM, and check the reading on the fuel pump inlet valve
   _____ c. check the specifications for the fuel pump pressure test, crank the engine and run it at the specified RPM, and check the reading on the fuel pump pressure gauge

3. During the fuel pump pressure test, the clamp on the fuel pump volume hose should be:
   _____ a. closed for the complete test
   _____ b. open before you read the pressure gauge
   _____ c. closed only after you crank the engine

4. Use the following vehicle specifications as you answer the questions below.

IDLE SPEED	
LOW IDLE 500	**CURB IDLE** 550
FUEL PUMP	
Vehicle model—make volume test at idle RPM	
Volume.....One pint in 45 seconds	
Pressure.....4 psi at 700 RPM	

   a. At what RPM should the engine be running during the pressure test? _____

   b. How much pressure should there be when the engine is running at the specified RPM?

   _____

   c. Would a reading of 4 on the pressure gauge be good, too high, or too low? _____

   d. Would a reading of 3 on the pressure gauge be good, too high, or too low? _____

5. If the fuel pump pressure and volume are too low:

_____ a. the fuel pump should be replaced first
_____ b. the cam lobe should be inspected first
_____ c. the fuel lines should be inspected first

6. If the fuel lines, connections, fuel filter, and fuel tank are all in good condition, but the fuel volume and pressure are too low, you should:

_____ a. repair the fuel lines
_____ b. repair the choke unit in the carburetor
_____ c. replace the fuel pump

7. If the fuel lines, connections, fuel filter, fuel tank, and fuel pressure are all good but the volume is too low, you should:

_____ a. repair the fuel line
_____ b. repair the choke unit in the carburetor
_____ c. replace the fuel pump

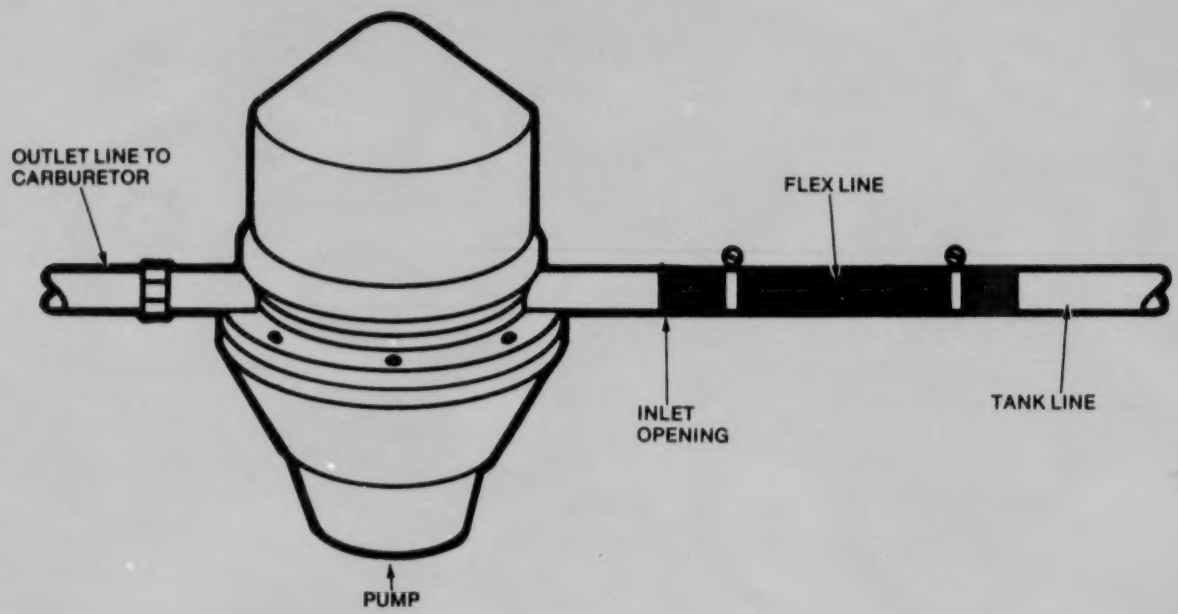
8. If there are excessive air bubbles in the fuel, but the fuel filter and the fuel tank are in good condition, you should:

_____ a. repair the fuel lines
_____ b. repair the choke unit in the carburetor
_____ c. replace the fuel pump

Turn to the back of this book and check your answers for Exercise 8.

EXERCISE 9

1. Use this diagram of the fuel pump and fuel lines as you answer the questions below.



a. Which line starts at the fuel tank?

_____

b. Which lines are also called fuel inlet lines? _____ and _____

c. To do the fuel pump vacuum test, where should you first connect the vacuum gauge hose?

_____

_____

d. To test the fuel pump directly, where should you connect the vacuum gauge?

_____

e. To check the fuel line from the tank to the pump for air leaks, where should you connect the vacuum gauge?

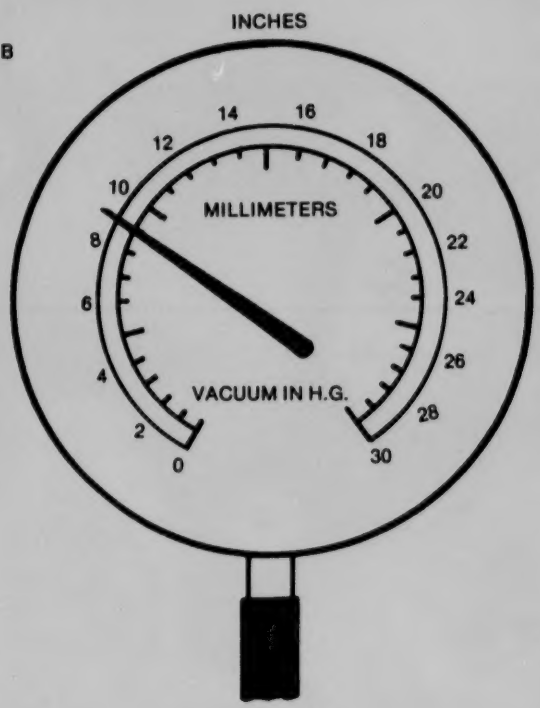
_____

_____

2. You have just finished the fuel pump vacuum test and the vacuum test on the flex line and have gotten the reading shown in Illustration A.

A

B



a. How many inches does the needle show? _____

b. This reading means that the fuel pump valves, the flex fuel line, and the filter gaskets do not have any _____.

c. How many inches does the needle show in Illustration B? _____

d. This reading means that you should test the _____ _____.

3. If the reading on the vacuum gauge is still low when you test the fuel pump directly, it means that the fuel _____ should be replaced.

4. You can check the entire line from the fuel tank to the pump for air leaks by doing the following:

   a. Disconnect the vacuum gauge from the fuel pump and reconnect the flex line to the _____ _____.

   b. Then disconnect the fuel line from the _____ and connect the vacuum gauge to the fuel inlet line.

   c. Run the engine at _____ RPM, repeating the vacuum test. Then _____ the engine.

   d. If the reading drops off quickly, then you know there's a leak in the line between the _____ _____ and the _____ _____.

Turn to the back of this book and check your answers for Exercise 9.

PERFORMANCE CHECKLIST—P.O. 25

The instructor will provide a live vehicle. Measure the fuel flow and pressure. All of the performances below must be accomplished.

STUDENT PERFORMANCES

INSTRUCTOR RATINGS

	ACCEPTABLE	NOT ACCEPTABLE	OMIT
1. Removes carburetor air cleaner assembly.			
2. Hooks up volume/pressure tester.			
3. Tests fuel pump volume and record results.			
4. Tests fuel pump pressure and record results.			
5. Compares results to manufacturer's specifications and reports any malfunctions.			
6. Tests fuel pump and fuel inlet lines for air leaks and records results.			
7. Removes test equipment and installs carburetor air cleaner assembly.			
8. Uses proper tools and equipment.			
9. Follows all appropriate safety precautions.			
10. Performs tasks in an acceptable amount of time.			

Keep a copy of this checklist for your records.

P.O. 26 PRETEST

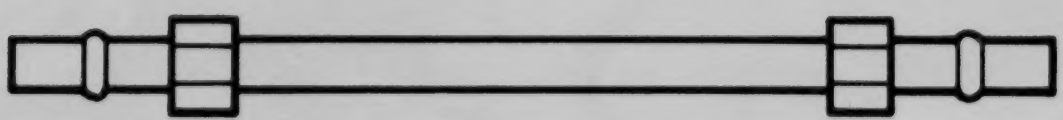
NAME _____

1. Check (✓) all the safety practices listed below that you should follow.
   - _____ a. Never use a droplight when working with the fuel system.
   - _____ b. Always check the rated capacity of hydraulic lift equipment before raising the vehicle.
   - _____ c. Match the threads squarely when connecting fuel fittings.
   - _____ d. Support a vehicle with jack stands after raising the vehicle with a hydraulic jack.
   - _____ e. Keep long hair under a hat.

2. Place a check (✓) beside all the special tools that may be used to service fuel lines.
   - _____ a. soldering or brazing tools
   - _____ b. tubing cutter
   - _____ c. brass hammer
   - _____ d. flare-nut wrench
   - _____ e. tubing bender
   - _____ f. cotter pin bender

3. What is the proper replacement material for a fuel hose?
   - _____ a. rubber tubing
   - _____ b. steel tubing
   - _____ c. neoprene tubing
   - _____ d. plastic (polyurethane) tubing

4. What type of fuel line fitting is pictured below?



   - _____ a. flared fitting
   - _____ b. connector fitting
   - _____ c. nut-and-sleeve fitting
   - _____ d. compression fitting

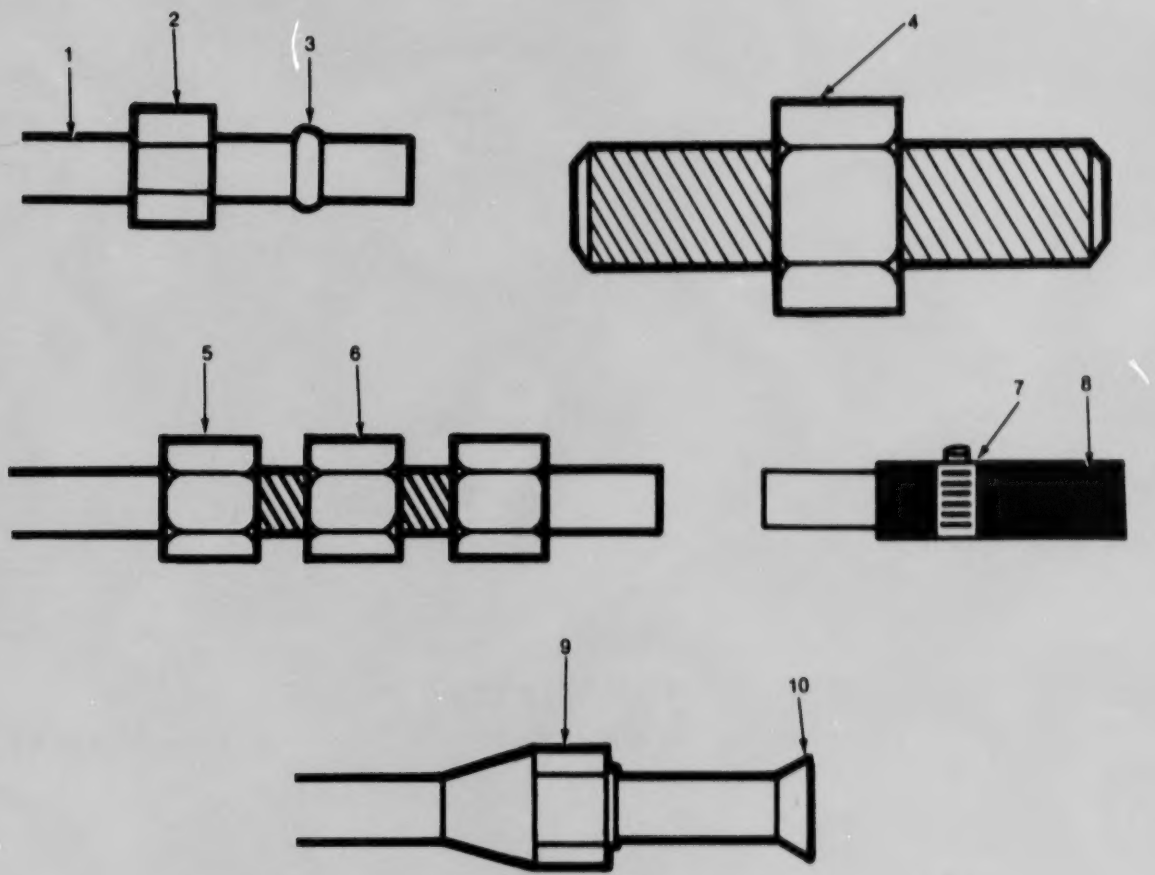
5. Damaged fuel hoses should be repaired by:
   - _____ a. replacing the defective portion with a new piece
   - _____ b. replacing the entire hose with a new one
   - _____ c. replacing the entire hose with a new fuel line

6. What material should ***never*** be used for repairing a fuel line?
   - _____ a. fuel hose material
   - _____ b. steel line
   - _____ c. copper line

7. When replacing sections of fuel line under the vehicle, what material is recommended?

_____ a. steel line
_____ b. flexible fuel hose

8. Identify each of the parts in the illustration by writing the letter of the correct part name in the proper blank. Some names may be used more than once.



Parts

_____ 1. a. flexible fuel hose
_____ 2. b. nut
_____ 3. c. fitting
_____ 4. d. sleeve
_____ 5. e. flare
_____ 6. f. union
_____ 7. g. fuel line
_____ 8. h. aircraft-type clamp
_____ 9. i. tubing cutter
_____ 10.

37

9. The correct procedure for making an operational check of any replacement fuel line or hose is to:

_____ a. check the fuel pump vacuum
_____ b. start the engine and check for leaks
_____ c. remove the fuel line from the carburetor inlet and measure the fuel pump pressure

10. Check (✓) the other tests you should make after repairing or replacing fuel lines.

_____ a. fuel pump vacuum test
_____ b. fuel pump volume test
_____ c. fuel pump pressure test
_____ d. fuel tank volume test

After you finish this pretest, carefully tear it out of the book and give it to your instructor. After s(he) has checked your answers, your instructor will direct you either to practice the work activities or to study the material covered by this test.

EXERCISE 10

1. What should you check before using hydraulic lift equipment so that you will not put too much weight on the lift?

   a. _____

   b. _____

2. What should you use with hydraulic floor jacks so that the vehicle will not fall? _____

3. Is it safe to rock a vehicle while it is on a hydraulic lift? _____

4. List four things that can go wrong with fuel lines and hoses.

   _____

   _____

   _____

   _____

5. What do you need to do to the vehicle in order to visually inspect the lines or hoses under the vehicle?

   _____

6. What should you do to the fuel filter and the fuel pump before inspecting the fuel lines or hoses during a major tune-up?

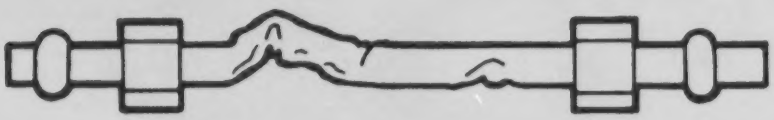
   a. _____

   b. _____

Turn to the back of this book and check your answers for Exercise 10.

EXERCISE 11

1. Below is a diagram of a steel fuel line that has been taken from under the vehicle. What do you need to do to repair the fuel line?



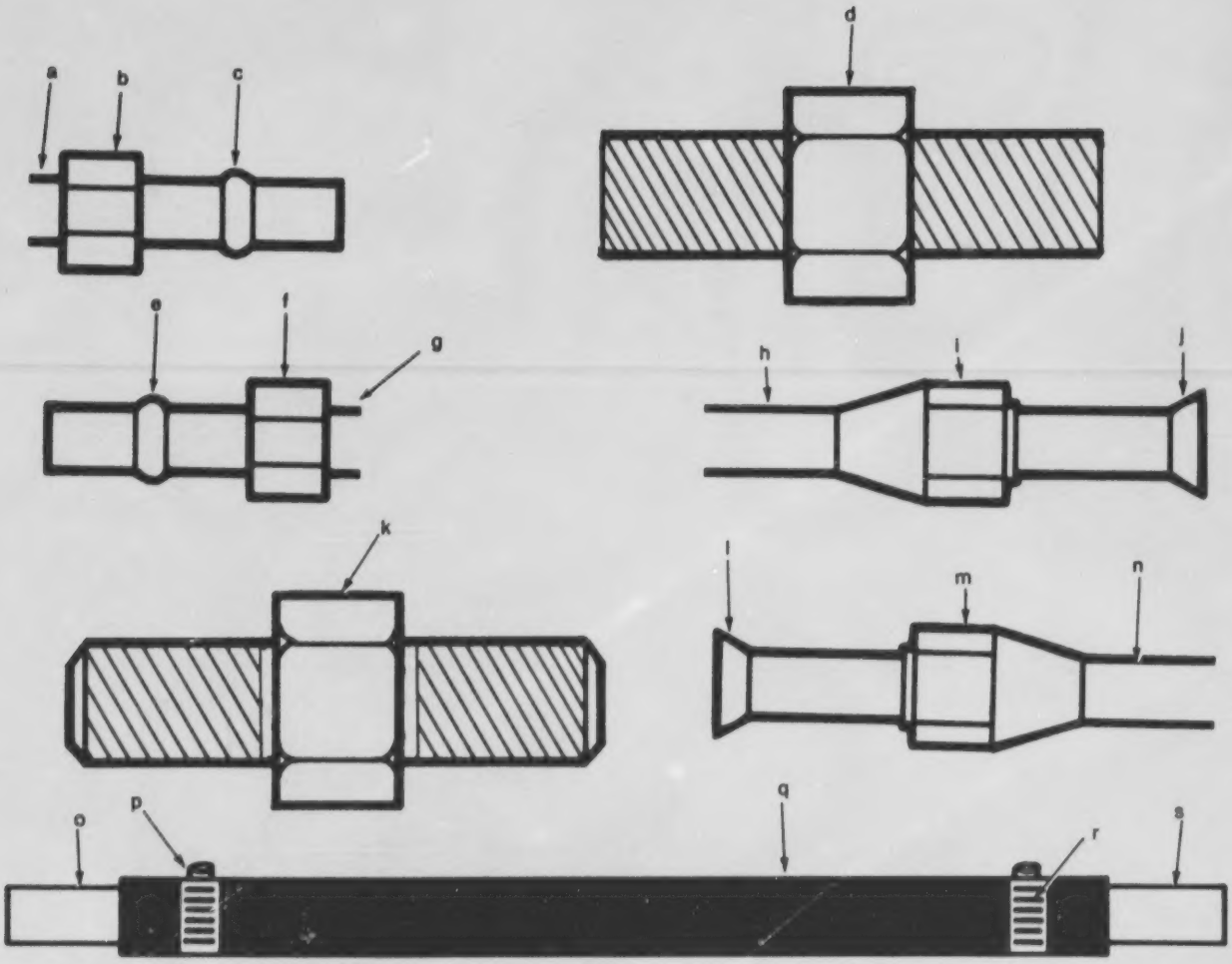
_____ a. Remove the fittings and replace the defective fuel line with copper tubing.
_____ b. Remove the fittings and replace the defective fuel line with a neoprene hose.
_____ c. Remove the fittings and replace the defective fuel line with steel tubing.

2. If the fuel line shown in Question 1 had been taken from the engine compartment, would it be safe to replace the fuel line with neoprene tubing (fuel hose)? _____

3. A defective neoprene fuel hose should be:

_____ a. repaired
_____ b. replaced

4. Label the parts indicated in the following diagram.



a. _____ g. _____ m. _____

b. _____ h. _____ n. _____

c. _____ i. _____ o. _____

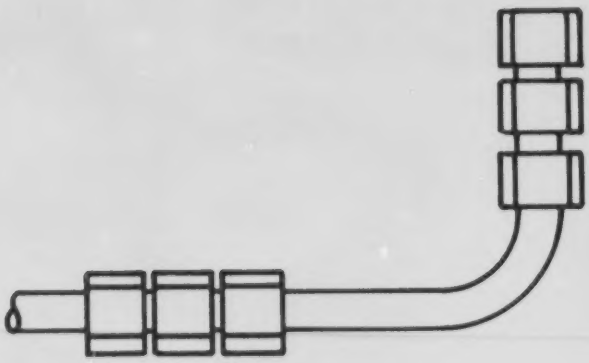
d. _____ j. _____ p. _____

e. _____ k. _____ q. _____

f. _____ l. _____ r. _____

s. _____

5. You have repaired a defective fuel line and your final work looks like that shown in the following diagram. What did you have to do to complete your work?



a. Use a _____ _____ to remove the defective part from the original line.

b. Use a _____ _____ to bend the replacement line.

c. Clean the burrs off of each cut end with a _____ file.

d. Slide a _____ and then a _____ onto each cut end.

e. Connect each complete sleeve, nut, and tubing assembly to the _____.

Turn to the back of this book and check your answers for Exercise 11.

PERFORMANCE CHECKLIST—P.O. 26

The instructor will provide either a live vehicle or shop vehicle. Remove and repair or replace any defective fuel lines on the vehicle. All the performances below must be accomplished.

STUDENT PERFORMANCES	INSTRUCTOR RATINGS		
	ACCEPTABLE	NOT ACCEPTABLE	OMIT
1. Raises vehicle as necessary.			
2. Inspects all fuel lines and hoses.			
3. Repairs or replaces defective sections as necessary.			
4. Lowers vehicle as necessary.			
5. Makes operational check of fuel lines and hoses.			
6. Uses proper tools and equipment.			
7. Follows all appropriate safety precautions.			
8. Performs tasks in an acceptable amount of time.			

Keep a copy of this checklist for your records.

P.O. 27 PRETEST

NAME _____

1. Check (✓) all the safety practices listed below that you should follow.

   _____ a. Wear eye protection when working beneath a vehicle.
   _____ b. Avoid using droplights when working on a vehicle's fuel system.
   _____ c. Remove the battery ground cable clamp when servicing an electric fuel pump.
   _____ d. Rock the vehicle from side to side after raising it one foot with a lift.
   _____ e. Avoid sparks or flames when working on a vehicle's fuel system.

2. When a fuel pump is found to be defective, the typical correction is to:

   _____ a. repair the fuel pump
   _____ b. replace the fuel pump

3. The steps listed below for removing a mechanical fuel pump are out of order. Write the letter of each step beside the proper number to show the correct sequence.

Order	Steps
_____ 1.	a. Note the position of the rocker arm as the pump is removed.
_____ 2.	b. Disconnect the fuel lines from the pump, and plug or clamp them if necessary.
_____ 3.	
_____ 4.	c. Remove the fuel pump.
_____ 5.	d. Clean the fuel pump and the engine mounting.
_____ 6.	e. Scrape off the old gasket material from the engine block.
_____ 7.	f. Remove the mounting hardware.
	g. Remove the heat shield.

4. Check (✓) all the procedures listed below that you should complete before installing a fuel pump on a vehicle.

   _____ a. Check all the fuel lines and connections for leaks or damage.
   _____ b. Remove the battery ground cable clamp when working with mechanical fuel pumps.
   _____ c. Coat all new gaskets with the proper sealant.
   _____ d. Verify that the fuel pump is the correct model and type for the vehicle.
   _____ e. Coat the fuel pump rocker arm and pushrod with the proper sealant.

5. The steps for installing a mechanical fuel pump are listed out of order below. Write the letter of each step beside the proper number to show the correct sequence.

Order	Steps
_____ 1.	a. Align fuel pump flange holes with the engine mounting block holes.
_____ 2.	b. Make an operational check of the fuel pump.
_____ 3.	c. Install the mounting hardware.
_____ 4.	d. Clean the engine mounting surface.
_____ 5.	e. Place the fuel pump's rocker arm into the engine block opening and align it properly.
_____ 6.	
_____ 7.	f. Reconnect the fuel lines.
	g. Install the gaskets on the plate mounting and on the fuel pump mounting.

After you finish this pretest, carefully tear it out of the book and give it to your instructor. After s(he) has checked your answers, your instructor will direct you either to practice the work activities or to study the material covered by this test.

EXERCISE 12

For Questions 1-4, tell why you should follow the safety practices listed.

1. Never light a match or cigarette, or cause any other spark or flame while working on the fuel system.

   _____

   _____

2. Clamp flexible fuel lines before disconnecting them.

   _____

   _____

3. Plug steel fuel lines after disconnecting them.

   _____

   _____

4. Avoid dropping the extension light while working on the fuel system.

   _____

5. When working with an electric fuel pump, you should check to make sure the ignition switch is turned _____. Also, disconnect the _____ before working with an electric fuel pump.

6. What should you be careful to do when connecting fittings (so that you will not damage the threads)? _____

   _____

Turn to the back of this book and check your answers for Exercise 12.

EXERCISE 13

For Questions 1-5, assume that you need to remove a mechanical fuel pump and that you have the following information:

- The fuel pump is mounted on the side of the engine block.
- The vehicle has a heat shield.
- The fuel pump has a pushrod.

1. How should you clean the fuel pump and the engine before removing the pump?

_____

_____

2. Put a *1* next to the first step, a *2* next to the second step, a *3* next to the third step, and so on, to indicate the proper procedure to follow after you have cleaned the parts.

_____ a. Disconnect the fuel lines from the pump.
_____ b. Remove the heat shield.
_____ c. Remove the pushrod.
_____ d. Remove the nuts and bolts from the mounting pad.
_____ e. Lift off the fuel pump.

3. If you can't lift the pump off easily, what should you do?

_____

_____

4. What should you notice about the rocker arm as you remove the fuel pump?

_____

5. What should you do to the old gasket left on the engine block?

_____

_____

Turn to the back of this book and check your answers for Exercise 13.

EXERCISE 14

1. What do you need to do to the fuel lines and connections before installing a fuel pump?

   _____

2. Suppose you have a new fuel pump to replace the defective one you have just removed. What should you check about the new fuel pump before trying to install it?

   _____

3. What should you do to the new gaskets before installing them?

   _____

4. Put a *1* next to the first step, a *2* next to the second step, a *3* next to the third step, and so on, to indicate the proper procedure to follow when you install the new gaskets.

   _____ a. Put the new gaskets on the plate mounting and over the engine block opening.
   _____ b. Attach the nuts and bolts to secure the fuel pump.
   _____ c. Crank the engine and check for fuel leaks.
   _____ d. Reconnect the fuel line and connections.
   _____ e. Align the holes in the fuel pump flange with the ones around the engine block opening (use mechanical fingers as needed).
   _____ f. Clean the engine mounting surface.
   _____ g. Put the rocker arm in the correct position.

5. When positioning the fuel pump, why would you need the mechanical fingers?

   _____

6. How can you tell if the rocker arm is in the correct position?

   _____

   _____

Turn to the back of this book and check your answers for Exercise 14.

PERFORMANCE CHECKLIST—P.O. 27

The instructor will provide either a live vehicle or live engine. Remove and replace the mechanical fuel pump. All of the performances below must be accomplished.

STUDENT PERFORMANCES

INSTRUCTOR RATINGS

	ACCEPTABLE		NOT ACCEPTABLE		OMIT
1. Raises vehicle as necessary.					
2. Disconnects fuel lines from fuel pump.					
3. Removes fuel pump mounting bolts and fuel pump.					
4. Installs new fuel pump mounting gasket on replacement pump.					
5. Installs replacement pump.					
6. Connects fuel lines.					
7. Lowers vehicle as necessary.					
8. Makes operational check of fuel pump.					
9. Uses proper tools and equipment.					
10. Follows all appropriate safety precautions.					
11. Performs tasks in an acceptable amount of time.					

Keep a copy of this checklist for your records.

P.O. 28 PRETEST

NAME _____

1. Check (✓) all the safety practices listed below that you should follow.
   - _____ a. Use fender covers only when you are wearing a belt.
   - _____ b. Avoid reaching into an engine compartment without looking.
   - _____ c. Route all cords or wires away from the engine fan belts and pulleys.
   - _____ d. Keep long hair under a hat.
   - _____ e. Avoid wearing loose clothing when working under the hood.

2. Which of these terms is ***not*** the same as ***slow idle***?
   - _____ a. base idle
   - _____ b. curb idle
   - _____ c. low idle

3. Check (✓) all the information sources that you could use to find detailed specifications for carburetor adjustment.
   - _____ a. automobile owner's manual
   - _____ b. technical service manual
   - _____ c. service record decal on door jamb
   - _____ d. decal in engine compartment
   - _____ e. manufacturer's shop manual

4. Check (✓) all the precautions that you should follow before adjusting a carburetor.
   - _____ a. De-energize the idle speed solenoid.
   - _____ b. Set the parking brake.
   - _____ c. Disable the ignition.
   - _____ d. Block the vehicle's drive wheels.
   - _____ e. Bring the engine to its normal operating temperature.

5. The purpose of idle limiters is to:
   - _____ a. prevent gross adjustment of the idle speed
   - _____ b. prevent gross adjustment of the idle mixture

6. How many idle mixture screws would a late model 2-barrel carburetor have?
   - _____ a. none
   - _____ b. 1
   - _____ c. 2
   - _____ d. 3

7. Where is the idle speed screw located on carburetors that do not have an idle speed solenoid?
   - _____ a. at the base of the carburetor
   - _____ b. directly beneath the fuel inlet valve
   - _____ c. on the choke mechanism
   - _____ d. on the throttle linkage

8. Which one of these terms is ***not*** the same as ***carburetor solenoid screw***?
   - _____ a. idle speed screw
   - _____ b. curb idle speed screw
   - _____ c. plunger screw

9. When is the idle speed solenoid energized?

_____ a. when the wire leading to it is connected
_____ b. when the wire leading to it is disconnected
_____ c. whenever the choke mechanism is engaged

10. What do you do with the carburetor air cleaner when adjusting idle speed and mixture?

_____ a. Remove it from the carburetor.
_____ b. Leave it on the carburetor.

11. The steps listed below for adjusting idle speed and mixture are out of order. Write the letter of each step beside the proper number to show the correct sequence.

Order	Steps
_____ 1.	a. Connect the tachometer to the engine.
_____ 2.	b. Readjust the idle speed if necessary.
_____ 3.	c. Turn out the screw a quarter turn.
_____ 4.	d. Remove hoses and plug them if necessary.
_____ 5.	e. Adjust the idle speed screw to base idle speed.
_____ 6.	f. Adjust the other mixture screw(s).
_____ 7.	g. Open the choke valve and air cleaner thermostatic valve.
_____ 8.	h. Adjust the mixture screw to 20 RPM drop.

12. Adjusting the mixture screws *in* on a carburetor (turning in a clockwise direction) will:

_____ a. lean the mixture
_____ b. enrich the mixture

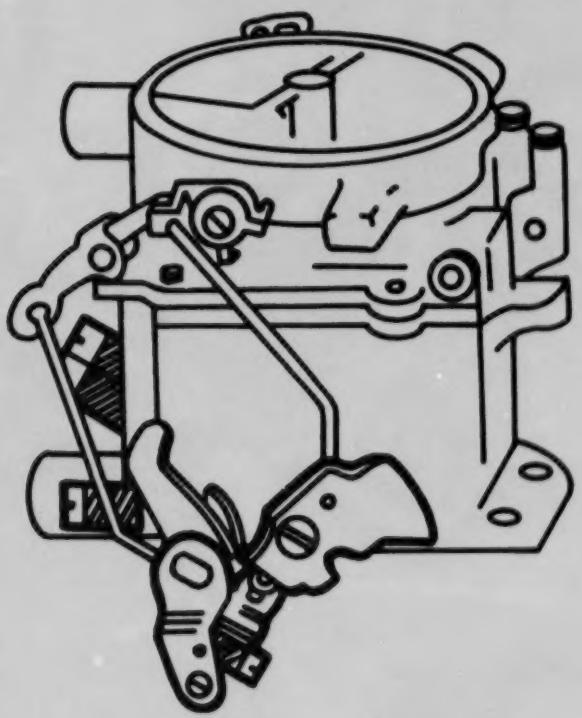
13. The steps for performing the lean-drop adjustment on a carburetor are listed out of order below. Write the letter of each step beside the proper number to show the correct sequence.

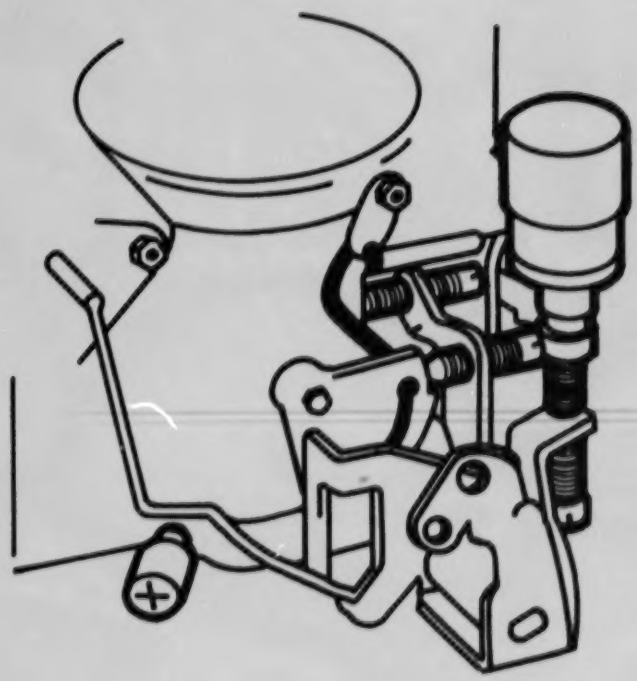
Order	Steps
_____ 1.	a. Make sure the idle stop solenoid is engaged.
_____ 2.	b. Adjust the mixture screw(s) to the specified RPM.
_____ 3.	c. Connect the tachometer to the engine.
_____ 4.	d. Turn the idle stop solenoid screw to 80 RPM greater than the specification.
_____ 5.	e. Bring the engine to operating temperature.
_____ 6.	f. Adjust the mixture screw(s) to reach the maximum RPM.

After you finish this pretest, carefully tear it out of the book and give it to your instructor. After s(he) has checked your answers, your instructor will direct you either to practice the work activities or to study the material covered by this test.

EXERCISE 15

1. Label the idle mixture screws and idle speed screws in these diagrams.





2. What would happen if you overtightened a mixture screw?
   _____ a. The air-fuel mixture would be normal.
   _____ b. A groove would form in the needle's taper.
   _____ c. The curb idle speed would be set.
   _____ d. The taper would be set in the correct position.

3. What are idle limiters?

   _____

4. What happens to the HC and CO levels when the fuel mixture is too rich?

   _____

5. Curb idle is the same as:
   _____ a. higher idle
   _____ b. lower idle
   _____ c. base idle
   _____ d. maximum idle

6. Low idle is the same as

_____ a. higher idle
_____ b. base idle
_____ c. maximum idle
_____ d. curb idle
_____ e. hot idle
_____ f. slow idle

7. Check all correct answers. An idle speed solenoid is the same as:

_____ a. an idle stop solenoid
_____ b. an anti-dieseling solenoid
_____ c. a dashpot solenoid

8. Check all correct answers. The carburetor solenoid screw is the same as:

_____ a. the solenoid plunger screw
_____ b. the low idle screw
_____ c. the curb idle solenoid screw

9. Check all correct answers. The low idle speed screw is the same as:

_____ a. the carburetor solenoid screw
_____ b. the idle mixture screw
_____ c. the carburetor idle cam screw

10. List two places that give you information on how to adjust idle speed and idle mixture.

a. _____

b. _____

52

11. Read these procedures and fill in the blanks below.

HOT (SLOW) IDLE RPM

With engine at normal operating temperature, remove air cleaner. Disconnect air cleaner vacuum hose at intake manifold and plug fitting. Set parking brake and block drive wheels, open choke fully, air conditioning "OFF", vapor canister and EGR valve hoses disconnected and plugged at carburetor. Adjust timing to specifications, leaving vacuum hose to distributor connected. Adjust idle stop solenoid screw (energized) to specifications with automatic transmission in "D" or manual transmission in neutral. Then adjust carburetor idle screw to specifications (solenoid de-energized) with automatic transmission in "D" or manual transmission in neutral.

	Idle Speed (RPM)	
	Solenoid	Solenoid
Application	Energized	De-energized
Man. Trans..	.800	.600
Auto. Trans..	.650	.500

IDLE MIXTURE

TACHOMETER (SPEED DROP) PROCEDURE

With engine at normal operating temperature, disconnect vapor canister hose from air cleaner. Disconnect and plug distributor vacuum hose and EGR valve vacuum hose. Turn air conditioning off, leave air cleaner installed and place automatic transmission in "D". Set idle to specified "Solenoid Energized" RPM, then turn out (richen) mixture screws until maximum RPM is obtained. Reset idle speed (if required) using idle stop solenoid screw to 80 RPM above specified idle RPM. Turn in (lean) mixture screws until specified idle RPM is again obtained.

From *National Service Data Tune-Up (I), Tune-Up, Carburetion, and Trouble Shooting.* ©1975 Mitchell Manuals, Inc. Used with permission of Mitchell Manuals, Inc.

a. The carburetor idle speed setting is the same as the _____ or _____ or _____ or _____ idle RPM setting.

b. The procedure for setting lean-drop RPM is the same as the _____ or _____ drop procedure.

c. If the solenoid is de-energized, is the solenoid wire connected or disconnected?

_____

d. If the solenoid is energized, is the solenoid wire connected or disconnected? _____

e. One of the sentences in the procedure says: "Reset idle speed (if required) using idle stop solenoid screw to 80 RPM above specified RPM."

(1) What is the specified RPM for a vehicle with manual transmission? _____

(2) What is 80 RPM above this specified RPM? _____

(3) Should the solenoid wire be connected or disconnected when you reset this idle speed to 80 RPM above specified RPM?

_____

12. Look at the decal below.

XZ
350-400 CU. IN.
2 BBL. CARB.
GM 104-2

VEHICLE EMISSION CONTROL INFORMATION
GENERAL MOTORS CORPORATION
GM

AIR-EGR EXHAUST EMISSION CONTROL	TRANSMISSION	
	AUTOMATIC	MANUAL
DWELL	30°	30°
TIMING (°STC @ RPM)	8° @ 600	0° @ 900
SOLENOID SCREW (RPM)	600 (DR)	900 (N)
BASE IDLE SCREW (RPM)	500 (DR)	500 (N)
LEAN DROP IDLE MIXTURE (RPM)	650-600 (DR)	1000-900 (N)
MAX. IDLE CO (% @ RPM)	0.5 @ 600 (DR)	0.5 @ 900 (N)

MAKE IDLE SPEED AND TIMING ADJUSTMENTS WITH ENGINE AT NORMAL OPERATING TEMP., CHOKE OPEN, AIR COND. OFF, AIR CLEANER INSTALLED, AND DISTR. VACUUM LINE DISCONNECTED AND PLUGGED. RECONNECT DISTR. VACUUM LINE WHEN ADJUSTMENTS ARE COMPLETED.

SET PARKING BRAKE AND BLOCK DRIVE WHEELS.

1. DISCONNECT FUEL TANK HOSE FROM VAPOR CANISTER.
2. ADJUST CARBURETOR SOLENOID SCREW TO SPECIFIED RPM.
3. SET DWELL AND TIMING AT SPECIFIED RPM. RESET IDLE SPEED IF NECESSARY.
4. ADJUST CARBURETOR IDLE CAM SCREW TO SPECIFIED BASE IDLE RPM ON LOW STEP OF CAM WITH SOLENOID WIRE DISCONNECTED. RECONNECT WIRE AFTER ADJUSTMENT.
5. IDLE MIXTURE HAS BEEN SET AT THE FACTORY. IF IDLE MIXTURE ADJUSTMENT IS NECESSARY, SEE SERVICE MANUAL FOR PROCEDURES. IDLE MIXTURE SPECIFICATIONS ARE SHOWN AT RIGHT.
6. REMOVAL OF MIXTURE SCREW CAPS AND/OR ALTERING IDLE MIXTURE TO OTHER THAN SPECIFICATIONS MAY VIOLATE FEDERAL AND OTHER STATE LAWS.
7. RECONNECT FUEL TANK HOSE TO VAPOR CANISTER.

SEE SERVICE MANUAL FOR ADDITIONAL INFORMATION FUEL REQUIREMENTS—USE 91 OCTANE OR HIGHER.

PRINTED IN U.S.A. THIS VEHICLE CONFORMS TO U.S. E.P.A. REGULATIONS APPLICABLE TO 1974 MODEL YEAR NEW MOTOR VEHICLES. PT. NO. 346258

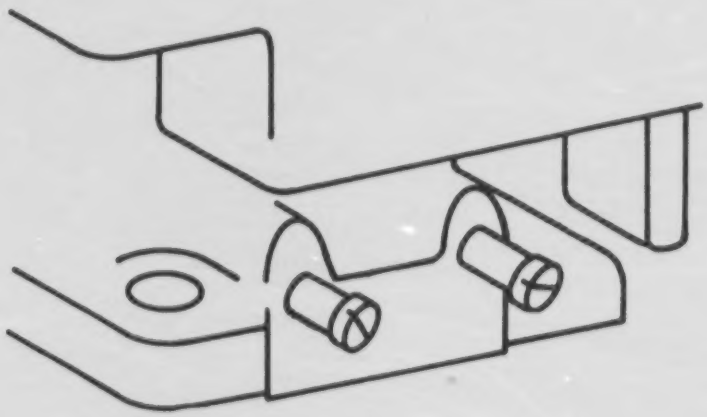
Courtesy General Motors Corporation.

a. Circle the preparation steps.
b. Draw a square around the steps for setting idle speed and idle mixture.
c. Draw a line through the steps for setting dwell and timing.
d. Draw a line through the specifications for dwell and timing.
e. Circle the specifications for idle speed and idle mixture.

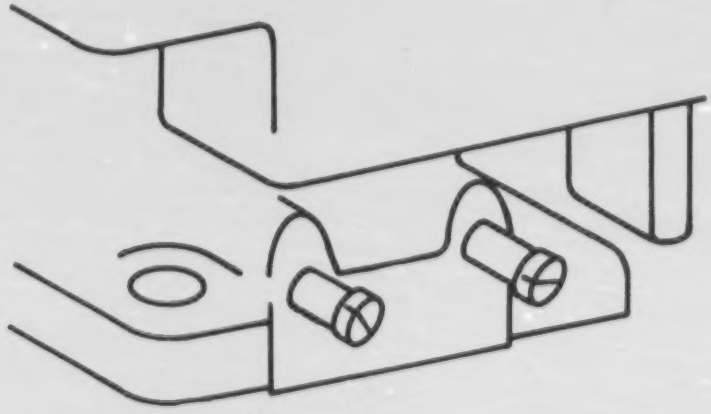
Turn to the back of this book and check your answers for Exercise 15.

EXERCISE 16

1. Draw arrows to show which way to turn the mixture screws to ***lean*** the fuel mixture.



2. Draw arrows to show which way to turn the mixture screws to ***enrich*** the fuel mixture.



3. Check only one answer. To do the lean-drop step:

   _____ a. turn the mixture screw OUT (rich) until the RPM increases a certain amount
   _____ b. turn the mixture screw IN (lean) until the RPM increases a certain amount
   _____ c. turn the mixture screw OUT (rich) until the RPM decreases a certain amount
   _____ d. turn the mixture screw IN (lean) until the RPM decreases a certain amount

4. You'll probably need to _____ the soleniod wire before you adjust the solenoid plunger screw (curb or solenoid slow idle).

5. Are you adjusting a ***lower*** or ***higher*** idle speed when you adjust the solenoid plunger screw?

   _____

6. After adjusting the mixture screw(s):

_____ a. lean the mixture 1/2 turn
_____ b. reset only the curb idle speed to specifications
_____ c. reset the solenoid slow idle and the carburetor low idle as necessary to specifications
_____ d. reset only the carburetor low idle speed as necessary to specifications

7. Match the list of words on the right with the list of words on the left. You can put more than one number in each blank on the left.

_____ a. base idle
_____ b. curb idle
_____ c. idle speed solenoid
_____ d. carburetor solenoid screw
_____ e. low idle speed screw
_____ f. lean drop

1. solenoid plunger screw
2. anti-dieseling solenoid
3. higher idle
4. lower idle
5. idle stop solenoid
6. hot idle
7. solenoid slow idle
8. carburetor idle speed screw
9. speed drop

8. What do you need to do to ***de-energize*** the solenoid?

_____

Use the following information to answer Questions 9-21 below. Take your time and answer each question carefully.

HOT (SLOW) IDLE RPM

With engine at normal operating temperature, remove air cleaner. Disconnect air cleaner vacuum hose at intake manifold and plug fitting. Set parking brake and block drive wheels, open choke fully, air conditioning "OFF", vapor canister and EGR valve hoses disconnected and plugged at carburetor. Adjust timing to specifications, leaving vacuum hose to distributor connected. Adjust idle stop solenoid screw (energized) to specifications with automatic transmission in "D" or manual transmission in neutral. Then adjust carburetor idle screw to specifications (solenoid de-energized) with automatic transmission in "D" or manual transmission in neutral.

Idle Speed (RPM)

Application	Solenoid Energized	Solenoid De-energized
Man. Trans..	.800	.600
Auto. Trans..	.650	.500

IDLE MIXTURE

TACHOMETER (SPEED DROP) PROCEDURE

With engine at normal operating temperature, disconnect vapor canister hose from air cleaner. Disconnect and plug distributor vacuum hose and EGR valve vacuum hose. Turn air conditioning off, leave air cleaner installed and place automatic transmission in "D". Set idle to specified "Solenoid Energized" RPM, then turn out (richen) mixture screws until maximum RPM is obtained. Reset idle speed (if required) using idle stop solenoid screw to 80 RPM above specified idle RPM. Turn in (lean) mixture screws until specified idle RPM is again obtained.

From *National Service Data Tune-Up (I), Tune-Up, Carburetion, and Trouble Shooting.* ©1975 Mitchell Manuals, Inc. Used with permission of Mitchell Manuals, Inc.

9. List the preparation steps for adjusting idle speed.

a. Run the engine until it reaches _____ _____ temperature.

b. _____ the air cleaner.

c. Disconnect the _____ _____ _____

_____ at the _____ _____.

d. Plug the _____ at the intake manifold.

e. Set the _____ _____.

f. _____ the drive wheels.

g. _____ the choke.

h. Turn the air conditioning to _____.

i. Disconnect the _____ _____ and _____

_____hoses at the carburetor.

j. Plug the _____ at the carburetor.

10. When you adjust the timing specifications for this vehicle, what should you do to the distributor vacuum hose?

_____

11. The idle stop solenoid screw is energized:

_____ a. when the solenoid wire is disconnected
_____ b. when the solenoid wire is connected
_____ c. all the time

12. Before adjusting the idle stop solenoid screw (energized), place an automatic transmission in

_____.

13. Before adjusting the idle stop solenoid screw (energized), place a manual transmission in

_____.

14. What screw should you turn to adjust the idle speed when the solenoid is energized?

_____

58

15. When the solenoid is energized, adjust the idle speed until the tachometer shows:

a. _____ RPM for a vehicle with a manual transmission

OR

b. _____ RPM for a vehicle with an automatic transmission.

16. What screw should you turn to adjust the idle speed when the solenoid is de-energized?

_____

17. When the solenoid is de-energized, adjust the idle speed until the tachometer shows:

a. _____ RPM for a vehicle with a manual transmission

OR

b. _____ RPM for a vehicle with an automatic transmission.

18. List the preparation steps for the speed-drop (lean-drop) procedures.

a. Run the engine until it reaches _____ _____ temperature.

b. Disconnect the _____ _____ _____ from the _____ _____.

c. Disconnect and _____ the _____ _____ and the _____ _____ _____ hoses.

d. Turn the air conditioning to _____.

e. Leave the _____ _____ installed (or reinstall it).

f. Set the _____ _____.

g. _____ the drive wheels.

h. Place an automatic transmission in _____.

i. Place a manual transmission in _____.

19. Solenoid energized speed is the same as:

_____ a. solenoid curb idle speed
_____ b. carburetor low idle speed
_____ c. both of the above

20. Solenoid de-energized speed is the same as:

_____ a. solenoid curb idle speed
_____ b. carburetor low idle speed
_____ c. both of the above

21. When setting lean drop, do the following steps.

a. Turn _____ the mixture screws until the maximum RPM shows on the tachometer.

b. (1) If the maximum RPM is 880 RPM for a manual transmission, _____ (do or don't) reset the idle speed.

(2) If maximum RPM is less than 880 RPM for a manual transmission, _____ (do or don't) reset the idle speed.

(3) Reset the idle speed, if necessary, until the tachometer shows _____ RPM above the specified idle RPM. This is _____ RPM for an automatic transmission and _____ RPM for a manual transmission.

c. After turning the idle stop solenoid screw to _____ RPM above the specified idle RPM, _____ (lean or enrich) the mixture screws until:

(1) _____ RPM is again obtained for a manual transmission

OR

(2) _____ RPM is again obtained for an automatic transmission.

Turn to the back of this book and check your answers for Exercise 16.

PERFORMANCE CHECKLIST—P.O. 28

The instructor will provide either a live vehicle or a live engine. Adjust the carburetor idle speed and mixture. All of the performances below must be accomplished.

STUDENT PERFORMANCES

1. Hooks up tachometer to engine.
2. Adjusts idle speed screw to manufacturer's specifications.
3. Adjusts idle mixture screws to manufacturer's specifications.
4. Readjusts idle speed as necessary.
5. Removes tachometer.
6. Uses proper tools and equipment.
7. Follows all appropriate safety precautions.
8. Performs tasks in an acceptable amount of time.

INSTRUCTOR RATINGS

ACCEPTABLE		NOT ACCEPTABLE		OMIT

Keep a copy of this checklist for your records.

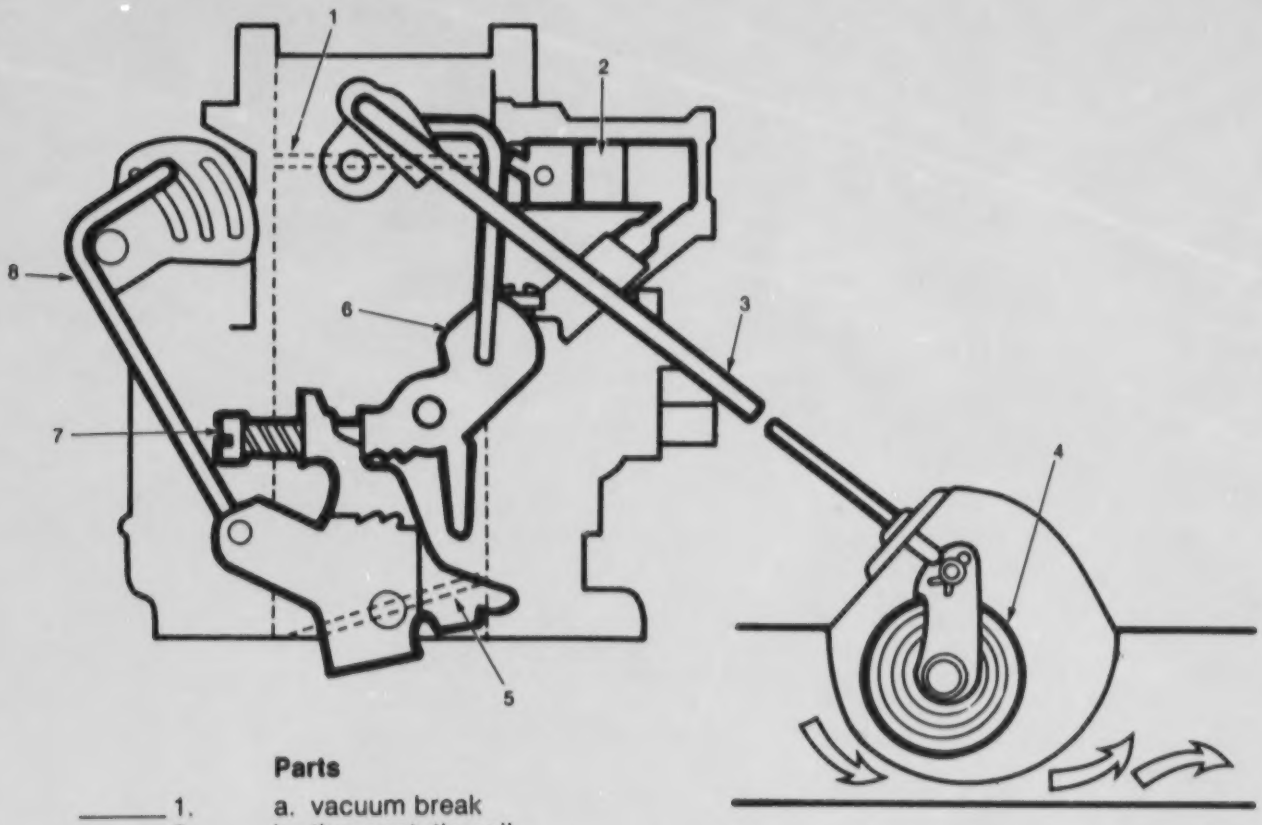
P.O. 29 PRETEST

NAME _____

1. Check (✓) all the safety practices listed below that you should follow.

_____ a. Avoid reaching into the engine compartment without looking first.
_____ b. Use fender covers when working under the hood.
_____ c. Wear very loose clothing for ease of movement.
_____ d. Wear jewelry on one arm only.
_____ e. Never aim an air hose at another person.

2. Identify each of the parts labeled in the illustration above by writing the letter of the correct part name in the proper blank.



Parts

_____ 1.
_____ 2.
_____ 3.
_____ 4.
_____ 5.
_____ 6.
_____ 7.
_____ 8.

a. vacuum break
b. thermostatic coil
c. throttle linkage
d. intermediate choke rod
e. unloader
f. choke piston
g. fast idle screw
h. choke valve
i. choke rod linkage
j. fast idle cam

62

3. The function of the automatic choke is to:

_____ a. provide a richer air-fuel mixture when the engine is cold
_____ b. provide a lean air-fuel mixture at cruising speed
_____ c. provide additional fuel to the carburetor under hard acceleration conditions
_____ d. prevent the air-fuel mixture from becoming too lean when the engine is hot

4. The function of the unloader mechanism is to:

_____ a. allow excess fuel to be discharged so that a cold engine will not become flooded
_____ b. send additional fuel to the choke mechanism under hard acceleration conditions
_____ c. override the choke mechanism and open the choke valve under certain engine conditions
_____ d. prevent the fuel-air mixture from becoming too lean when the engine is decelerated

5. To make automatic choke adjustments, you will need:

_____ a. a carburetor linkage bending tool and a brass hammer
_____ b. slip-joint pliers and wire gauges
_____ c. a torque wrench and screwdrivers
_____ d. wire gauges and a carburetor linkage bending tool
_____ e. a carburetor linkage bending tool and needle-nose pliers

6. If any parts of the choke are dirty or gummed, the recommended service procedure is to:

_____ a. replace the parts
_____ b. clean the parts with manifold heat control lubricant
_____ c. clean the parts with choke cleaner solvent
_____ d. clean the parts with carburetor cleaner solvent

7. Which type of automatic choke usually will require more adjustments?

_____ a. a piston-operated choke
_____ b. a vacuum-break-operated choke

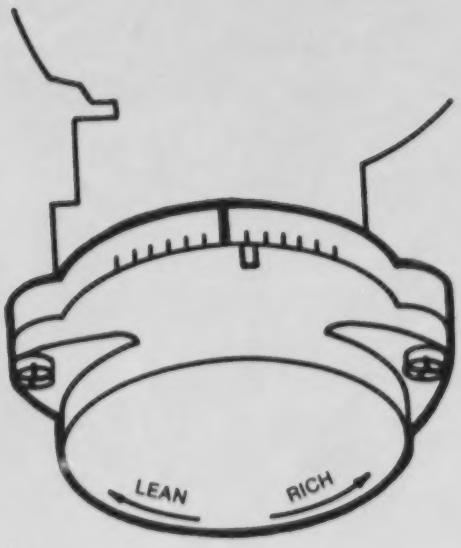
8. The steps for setting a piston-operated automatic choke are listed out of order below. Write the letter of each step beside the proper number to show the correct sequence.

Order	Steps
_____ 1.	a. Install the thermostat cover and the coil assembly.
_____ 2.	b. Install the cover attaching screws and tighten them snugly.
_____ 3.	c. Make sure the choke screen is installed.
_____ 4.	d. Set the thermostat cover at the manufacturer's specified setting.
_____ 5.	e. Rotate the cover assembly until the marking on the cover aligns with the index.
_____ 6.	f. Install the plate and the thermostat cover gasket.

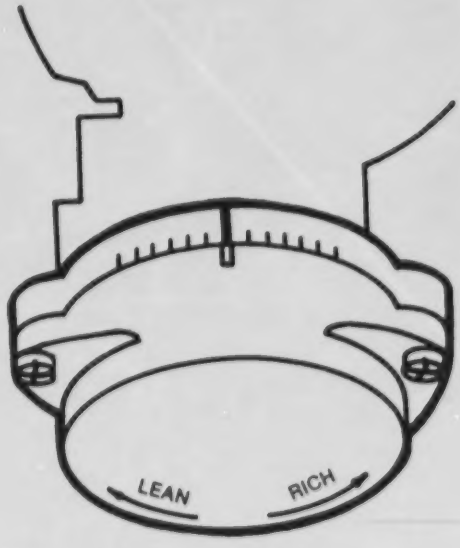
9. Which of these statements about adjusting an unloader mechanism is true?

_____ a. The adjustment is performed with the throttle valve fully shut.
_____ b. The choke screen must be replaced after adjusting the unloader.
_____ c. The adjustment is performed with the choke valve wide open.
_____ d. The proper gauge is inserted between the upper edge of the choke valve and the inner air horn wall.

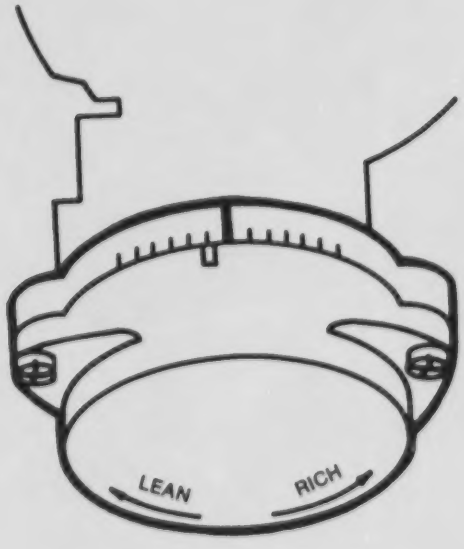
10. Which of the illustrations below shows the correct automatic choke adjustment for a specified setting of 1NL?



A



B



C

_____ a. A
_____ b. B
_____ c. C

84

11. Which of the following statements about making an operational check on a good choke mechanism is *not* correct?

_____ a. The choke unloader should shut the choke valve when the throttle valve is wide open.
_____ b. The choke valve should gradually open as the engine warms up.
_____ c. The choke valve should be closed when the throttle valve is opened on a cold engine.

12. Which of the illustrations below shows the fast idle screw on the highest step of the fast idle cam?

A B C

_____ a. A
_____ b. B
_____ c. C

13. Which of the following statements about adjusting the choke-rod fast idle cam is true for a vacuum-break automatic choke?

_____ a. The vacuum-break mechanism must be adjusted before the choke-rod fast idle cam can be adjusted.
_____ b. Some carburetors must be removed from the engine in order to adjust the choke-rod fast idle cam.
_____ c. The idle mixture and low idle speed must not be adjusted after the choke-rod fast idle cam is adjusted.
_____ d. For most carburetors, the choke-rod fast idle cam is not adjustable.

14. Where is the measuring gauge placed when you adjust the vacuum-break mechanism on an automatic choke?

_____ a. between the throttle valve and the unloader mechanism
_____ b. between the choke valve and the choke shaft
_____ c. between the intermediate choke rod and the fast idle cam
_____ d. between the inner air horn wall and the choke valve

15. Where is the auxiliary vacuum break located on a carburetor equipped with a primary and auxiliary vacuum break?

_____ a. inside the choke housing
_____ b. on the same side of the carburetor as the throttle linkage
_____ c. on the same side of the carburetor as the choke coil
_____ d. on the same side of the carburetor as the primary vacuum break

16. How should the throttle valve be positioned for most automatic choke adjustments?

_____ a. The throttle valve should be fully shut.
_____ b. The throttle valve should be wide open.
_____ c. The throttle valve should be about half open.
_____ d. The position of the throttle valve is not important.

17. Check (✓) the method(s) that can be used to seat the diaphragm on a vacuum-break mechanism.

_____ a. Apply air pressure at the vacuum-break nozzle.
_____ b. Push inward on the vacuum-break plunger.
_____ c. Apply vacuum from an external source at the vacuum-break nozzle.
_____ d. Pull outward on the vacuum-break plunger.

18. The steps for adjusting an intermediate choke rod on a car with a vacuum-break choke are listed out of order below. Write the letter of each step beside the proper number to show the correct sequence.

Order	**Steps**
_____ 1.	a. Align the edge of the coil lever with the projection on the choke housing.
_____ 2.	b. Remove the choke rod and the fast idle linkage.
_____ 3.	c. Use the proper tool to adjust the choke rod as necessary.
_____ 4.	d. Set the fast idle screw on the highest step of the fast idle cam.
_____ 5.	e. Reassemble all the disconnected or removed parts.
_____ 6.	f. Remove the thermostatic cover, the coil assembly, and the inside baffle plate.
_____ 7.	g. Close the choke valve as directed in the technical service manual.

After you finish this pretest, carefully tear it out of the book and give it to your instructor. After s(he) has checked your answers, your instructor will direct you either to practice the work activities or to study the material covered by this test.

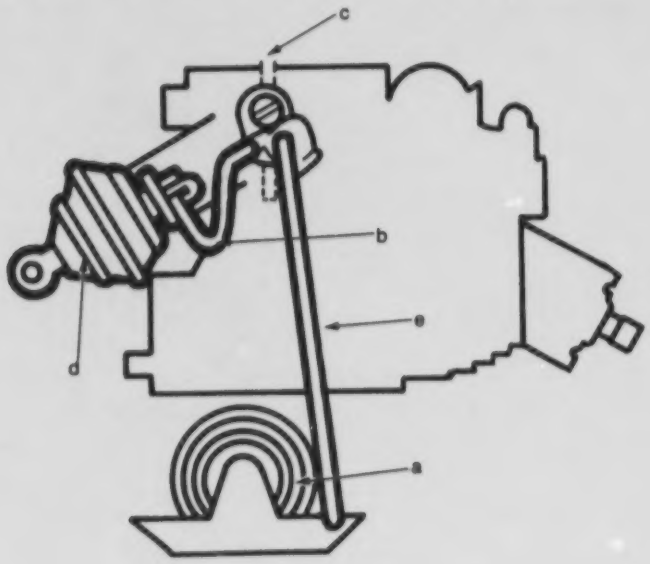
EXERCISE 17

1. The choke _____ is the part of the choke unit that opens and closes.
2. The choke _____ is the part that turns to open and close the choke valve.
3. When the engine starts, the choke _____ is pulled down by vacuum to help open the choke valve.
4. To keep the choke piston from moving toward the vacuum when the engine is cold, a _____ _____ is used. This mechanism relaxes its tension when the engine is _____.
5. The choke/throttle _____ connects the throttle valve to the choke valve.
6. List the two main types of automatic choke units.

   a. _____

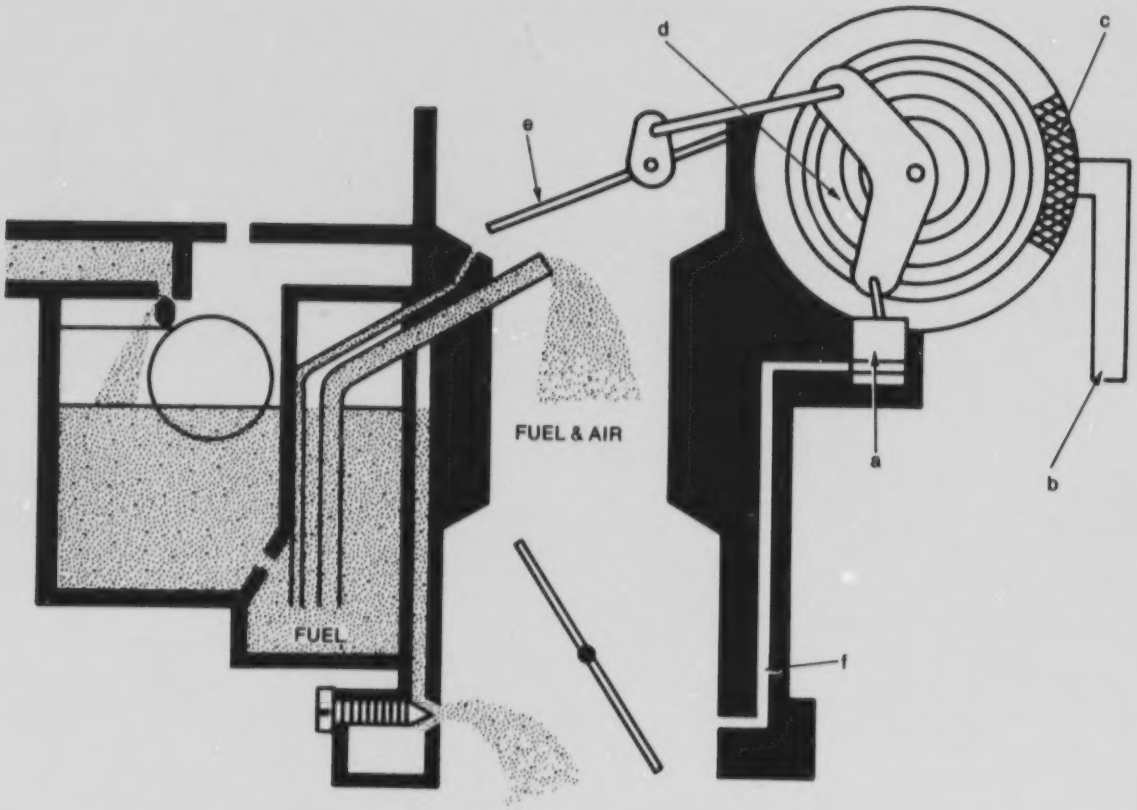
   b. _____

7. In the diagram below, match the letters with the names of the parts.



_____ choke valve
_____ vacuum break
_____ choke rod
_____ coil
_____ vacuum break rod

8. In the diagram below, match the letters with the names of the parts.



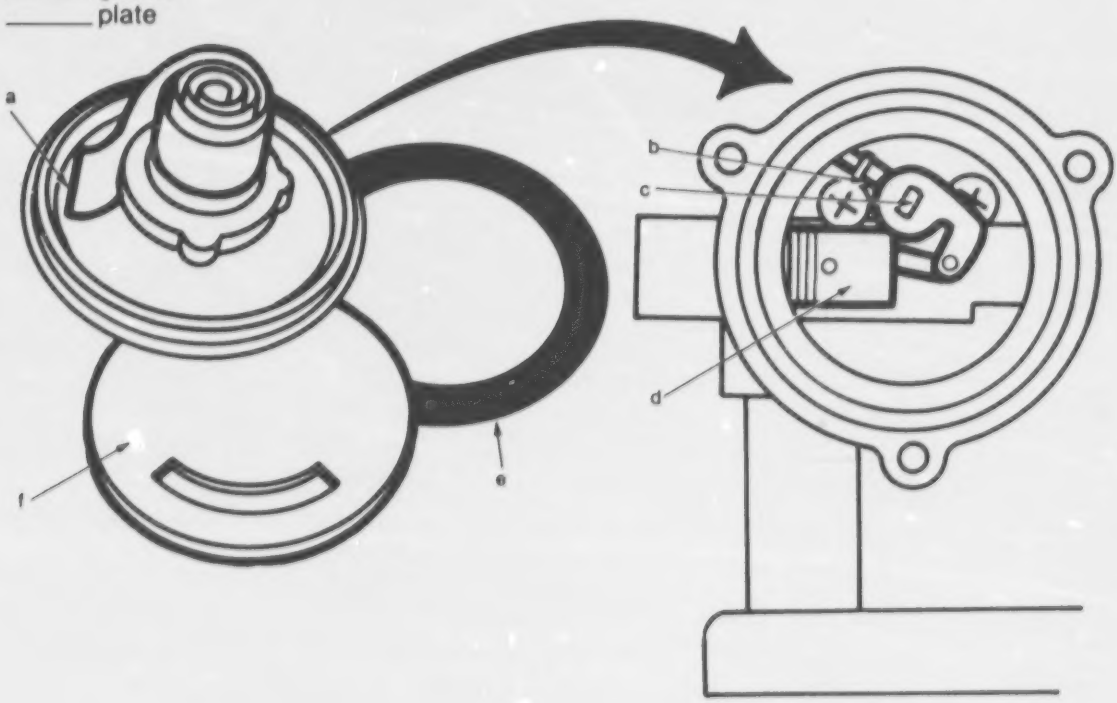
_____ thermostatic coil
_____ screen
_____ heat stove
_____ choke valve
_____ choke piston
_____ manifold vacuum

Turn to the back of this book and check your answers for Exercise 17.

EXERCISE 18

1. Match the names of the parts with the letters in the diagram.

_____ choke lever
_____ thermostatic coil
_____ choke piston
_____ choke shaft
_____ gasket
_____ plate



2. There are three basic steps to follow in cleaning and inspecting an automatic choke unit:

   a. Remove the _____ _____.

   b. Remove the _____ _____ _____.

   c. Check the _____ and _____ to make sure they are moving freely.

3. You should carefully check the position of the thermostat _____ as you remove the thermostat _____ so that you can put it back in the correct position.

4. To check the operation of the piston-type automatic choke, do the following:

   a. Check the _____ and _____ for free movement.

   b. Check the _____ valve and _____ for free movement.

   c. Check the _____ linkage for free movement.

   d. Check the _____ (if there is one) to see whether it's dirty.

   e. Loosen any gummed or sticking parts with choke _____ _____.

   f. Blow out the cleaned parts with a/an _____ _____.

Use the following information to answer Questions 5-8:

You are ready to adjust the choke rod. Before you can do this correctly, however, you'll need to open the throttle valve, close the choke valve, and check the piston position.

5. To open the throttle valve, you should:

   _____ a. push up on the throttle linkage
   _____ b. push down on the throttle linkage
   _____ c. push up on the choke lever

6. To close the choke valve, you should:

   _____ a. push up on the intermediate choke lever
   _____ b. push down on the intermediate choke lever
   _____ c. push up on the throttle linkage

7. To find the choke piston position for the vehicle, you should:

   _____ a. look on the thermostat cover
   _____ b. look in the technical service manual
   _____ c. look at the index 1R mark

8. To find out whether the choke piston position needs to be adjusted:

   _____ a. check to see whether the piston is flush with the top end of the cylinder
   _____ b. use a wire gauge to find out how far the end of the piston is from the end of the cylinder
   _____ c. check to see whether there's a difference between the position specified in the technical service manual and the actual position

9. How can you adjust the choke rod so that the choke piston is in the correct position?

   _____ the choke rod, using a carburetor linkage _____ tool.

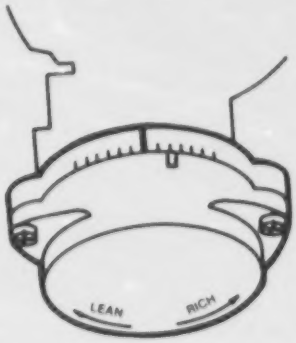
10. To adjust the choke rod, _____ the position of the choke _____ and compare it with the specified position.

11. Listed below are the steps for reassembling and adjusting the automatic choke setting. Put them in order by placing a *1* by the first step, a *2* by the second step, and so on.

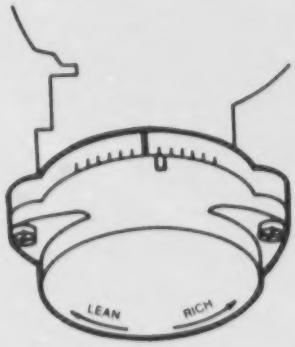
_____ Install the plate and thermostat cover gasket.
_____ Be sure the choke screen is installed.
_____ Rotate the cover assembly to the index position.
_____ Install the attaching screws.
_____ Install the thermostat cover and the coil assembly.

12. Match each of the figures with the correct automatic choke setting. (Some figures may be correct for more than one setting.)

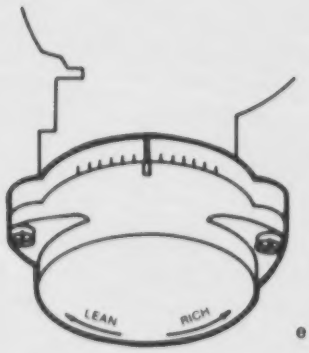
a



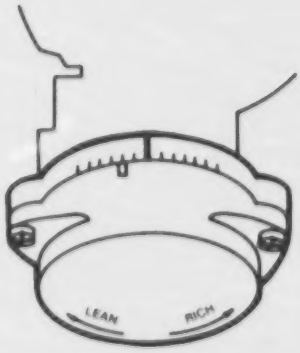
b



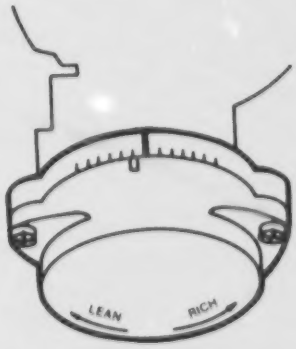
c



d



e



_____ 1NL
_____ 2L
_____ 2NR
_____ 1L
_____ 1R
_____ INDEX
_____ 2NL
_____ 2R

71

13. Check (✓) all the correct procedures for making an operational check of your work.

_____ a. Make sure all of the parts are reassembled.
_____ b. Crank the engine.
_____ c. Check to see whether the choke closes when the engine is cold.
_____ d. Check to see whether the choke opens during the warm-up period.

Turn to the back of this book and check your answers for Exercise 18.

EXERCISE 19

1. One of the steps for adjusting the intermediate choke rod is lining up the edge of the coil lever with the edge of the projection on the casting inside the choke housing. This step means that you should:

   _____ a. check the position of the thermostatic coil as you remove the thermostatic cover
   _____ b. adjust the position of the coil with a carburetor linkage adjusting tool
   _____ c. adjust the coil unit with a hot water assist
   _____ d. bend the intermediate choke rod until the edge of the coil lever is in the position described above

2. To close the choke valve you should:

   _____ a. push up on the throttle linkage
   _____ b. push the choke coil lever counterclockwise
   _____ c. push the choke coil lever clockwise
   _____ d. follow the directions in the technical service manual

3. One of the steps for adjusting the intermediate choke rod is placing the fast idle screw on the highest step of the cam. This step means that you should:

   _____ a. place the fast idle screw on the lowest step of the cam
   _____ b. place the fast idle screw on the highest step of the cam
   _____ c. place the low idle screw on the lowest step of the cam

4. Two steps for adjusting the choke coil on a hot water assist unit are (1) aligning the inside choke cover with the index mark on the outer cover, and (2) rotating the cover counterclockwise and aligning index marks. These steps mean that you should:

   _____ a. turn the outside cover until it comes off easily
   _____ b. turn the outside cover in this direction ↷ until the index marks match up
   _____ c. turn the outside cover in this direction ↶ until the index marks match up

5. Two steps for adjusting the choke rod are (1) making sure the top edge of the rod or the pin on the swivel are in the specified location, and (2) bending the rod or turning the swivel up or down to adjust. These steps mean that you should:

   _____ a. bend the rod (or turn the swivel) until the choke valve opens
   _____ b. bend the rod (or turn the swivel) until the top edge of the rod (or the pin on the swivel) is in the specified location
   _____ c. bend the rod (or turn the swivel) until the rod slips out of the choke lever

6. What should you do to the slow idle and fast idle screws before making a choke rod adjustment?

   _____ a. remove the slow idle and fast idle screws
   _____ b. tighten the slow idle screw and loosen the fast idle screw
   _____ c. turn the slow idle and fast idle screws until they are in the positions specified in a technical service manual

7. One of the steps that may be used for adjusting a vacuum break is seating the diaphragm, using an outside vacuum source. This step means that you should:

   _____ a. blow on the purge bleed opening
   _____ b. attach a hand vacuum pump to the diaphragm
   _____ c. apply a vacuum to the air horn

8. To find the carburetor adjustment specifications for the carburetor you're working on, use the _____ _____ number to look up the adjustment specifications in a _____ _____ _____.

9. To open the throttle valve, you should:
   _____ a. push up on the choke lever
   _____ b. push up on the throttle linkage
   _____ c. push down on the throttle linkage
   _____ d. follow the directions in a technical service manual

10. Check (✓) all of the correct procedures for adjusting the unloader.
   _____ a. Open the throttle valve completely.
   _____ b. Check the technical service manual for the gauge size specification.
   _____ c. Use the carburetor model number to find the carburetor adjustment specifications.
   _____ d. Place a gauge between the upper edge of the choke valve and the air horn wall.
   _____ e. Hold the choke valve toward the closed position.
   _____ f. Bend the unloader tang until the gauge slides in and out of place with slight friction on each side.

11. Check (✓) all the correct procedures for making an operational check of your work.
   _____ a. Check to be sure all the parts are reassembled.
   _____ b. With the engine cold, open the carburetor throttle part way.
   _____ c. With the engine cold, open the carburetor throttle all the way.
   _____ d. Check to see whether the choke opens during the warm-up period.

Turn to the back of this book and check your answers for Exercise 19.

PERFORMANCE CHECKLIST—P.O. 29

The instructor will provide either a live vehicle or a live engine. Clean and adjust an automatic choke. All the performances below must be accomplished.

STUDENT PERFORMANCES	INSTRUCTOR RATINGS		
	ACCEPTABLE	NOT ACCEPTABLE	OMIT
1. Removes carburetor air cleaner assembly.			
2. Inspects and cleans choke unit parts as necessary.			
3. Adjusts intermediate choke rod (or adjusts choke piston position).			
4. Adjusts thermostatic choke coil (or adjusts automatic choke setting).			
***5.** Adjusts choke coil rod.			
***6.** Adjusts fast idle cam.			
***7.** Adjusts vacuum break and auxiliary break (if so equipped).			
8. Adjusts the unloader.			
9. Makes operational check of all adjustments and installs air cleaner assembly.			
10. Uses proper tools and equipment.			
11. Follows all appropriate safety precautions.			
12. Performs tasks in an acceptable amount of time.			

*These steps should be omitted if the particular choke mechanism is the piston-operated type.

Keep a copy of this checklist for your records.

P.O. 30 PRETEST

NAME _____

1. Check (✓) all the safety practices listed below that you should follow.
   - _____ a. Avoid sparks or flames when working around a carburetor.
   - _____ b. Keep long hair under a hat.
   - _____ c. Use fender covers only when you are wearing a belt.
   - _____ d. Make sure your work area has good ventilation.
   - _____ e. Wear loose-fitting clothes for ease of movement.
   - _____ f. Use proper tools when removing fuel fittings.

2. When removing flexible fuel lines, you should:
   - _____ a. plug the lines after disconnecting them
   - _____ b. clamp the lines before disconnecting them
   - _____ c. clamp the lines after disconnecting them

3. What special tool should be used on fuel line fittings?
   - _____ a. an offset wrench
   - _____ b. a box-end wrench
   - _____ c. a vise-grip pliers
   - _____ d. a flare-nut wrench
   - _____ e. a combination wrench

4. Check (✓) all the safety practices listed below that you should follow when removing a carburetor.
   - _____ a. Cover the intake manifold with rags after removing the carburetor.
   - _____ b. Leave the key in the ignition switch.
   - _____ c. Place a note on the vehicle's steering wheel stating that the carburetor has been removed.
   - _____ d. Drain excess fuel from the carburetor into the intake manifold.

5. When installing fuel line fittings, it is important to:
   - _____ a. use only an open-end wrench for tightening
   - _____ b. match the threads squarely
   - _____ c. match the threads at a slight angle to increase the strength of the connection
   - _____ d. use only a box-end wrench for tightening

6. The steps for removing a carburetor are listed out of order below. Write the letter of each step beside the proper number to show the correct sequence.

Order	Steps
_____ 1.	a. Disconnect the accelerator and choke linkage.
_____ 2.	b. Remove the fuel lines, hoses, and wires from the carburetor.
_____ 3.	c. Remove the carburetor and drain the excess fuel from the float bowl.
_____ 4.	d. Remove the carburetor air cleaner and gasket.
_____ 5.	e. Mark all the wires and hoses with masking tape.
_____ 6.	f. Remove the carburetor hold-down bolts.
_____ 7.	g. Cover the intake manifold.

7. The steps for replacing a carburetor are listed out of order below. Write the letter of each step beside the proper number to show the correct sequence.

Order	Steps
_____ 1.	a. Reconnect all the fuel lines, wires, and hoses to the carburetor.
_____ 2.	b. Install a new gasket over the intake manifold.
_____ 3.	c. Complete the final carburetor idle adjustment.
_____ 4.	d. Install the carburetor air cleaner gasket and air cleaner.
_____ 5.	e. Clean the old carburetor mounting gasket from the intake manifold.
_____ 6.	f. Make sure the replacement carburetor is the proper model.
_____ 7.	g. Install the carburetor and tighten the hold-down nuts in proper sequence.

After you finish this pretest, carefully tear it out of the book and give it to your instructor. After s(he) has checked your answers, your instructor will direct you either to practice the work activities or to study the material covered by this test.

EXERCISE 20

1. Place a check (✓) beside the statements that describe safety procedures to follow when removing and installing a carburetor.

_____ a. Work in an area that has plenty of ventilation.
_____ b. Never ignite any material while servicing a carburetor.
_____ c. Do not clamp flexible fuel lines before disconnecting them.
_____ d. Always plug steel fuel lines after disconnecting them.
_____ e. Use a flare-nut wrench on the fittings to avoid rounding off the fitting edges.
_____ f. Match threads squarely when connecting fittings.
_____ g. After removing the carburetor, place masking tape or rags over the intake manifold.
_____ h. Place a note on the steering wheel stating that the carburetor has been removed.

2. The steps for ***removing*** a carburetor are listed out of order below. Write the letter of each step by the proper number to show the correct sequence.

Order	Steps
_____ 1.	a. Remove the carburetor air cleaner and the air cleaner gasket.
_____ 2.	b. Remove the connecting hoses and lines and mark them with masking tape.
_____ 3.	c. Place rags or masking tape over the intake manifold.
_____ 4.	d. Disconnect the accelerator and choke linkage from the carburetor.
_____ 5.	e. Check the carburetion section of a technical service manual for the
_____ 6.	vehicle you're working on.
_____ 7.	f. Remove the fuel lines and hoses connected to the carburetor.
_____ 8.	g. Place a note on the steering wheel stating that the carburetor has been
_____ 9.	removed.
_____ 10.	h. Remove any wires connected to the carburetor and mark them.
	i. Remove the carburetor hold-down bolts.
	j. Lift the carburetor from the vehicle and drain the gasoline from the float bowl.

3. The steps for ***installing*** a carburetor are listed out of order below. Write the letter of each step by the proper number to show the correct sequence.

Order	Steps
_____ 1.	a. Place a new gasket over the intake manifold.
_____ 2.	b. Reconnect the wires to the carburetor.
_____ 3.	c. Perform carburetor idle adjustments.
_____ 4.	d. Remove the carburetor mounting gasket from the intake manifold.
_____ 5.	e. Reinstall the carburetor air cleaner gasket and the air cleaner.
_____ 6.	f. Reinstall the carburetor and tighten the hold-down bolts in sequence.
_____ 7.	g. Check the identification number of the new carburetor and make sure it
_____ 8.	matches the number of the old carburetor.
_____ 9.	h. Reconnect the fuel lines to the carburetor.
	i. Reconnect the vacuum lines and hoses to the carburetor.

Turn to the back of this book and check your answers for Exercise 20.

PERFORMANCE CHECKLIST—P.O. 30

The instructor will provide either a live vehicle or a live engine. Remove and replace the carburetor. All of the performances below must be accomplished.

STUDENT PERFORMANCES	INSTRUCTOR RATINGS		
	ACCEPTABLE	NOT ACCEPTABLE	OMIT
1. Removes carburetor air cleaner assembly.			
2. Marks all wires, hoses, and lines.			
3. Disconnects fuel lines, hoses, wires, and linkages.			
4. Removes hold-down bolts. Removes carburetor and drains fuel from float bowl.			
5. Cleans off old carburetor mounting gasket and installs new gasket.			
6. Reinstalls carburetor and tightens bolts in proper sequence.			
7. Attaches all linkages, wires, hoses, and lines.			
8. Installs carburetor air cleaner assembly.			
9. Adjusts idle speed and mixture as necessary.			
10. Uses proper tools and equipment.			
11. Follows all appropriate safety precautions.			
12. Performs tasks in an acceptable amount of time.			

Keep a copy of this checklist for your records.

P.O. 31 PRETEST

NAME _____

1. Check (✓) all the safety practices listed below that you should follow.

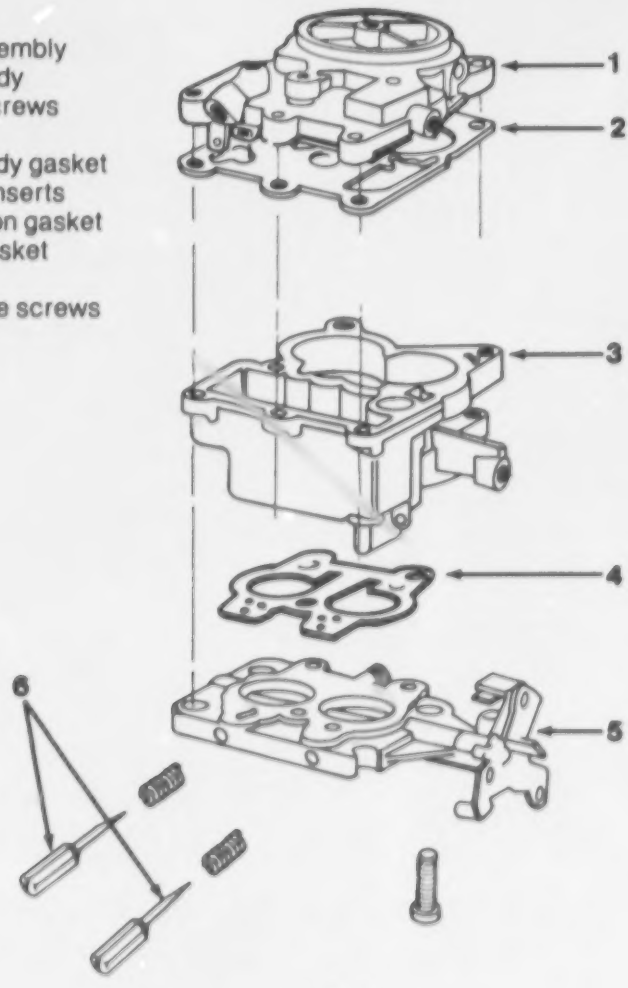
_____ a. Work only in areas that have good ventilation when servicing the carburetor.
_____ b. Never place rags over or in the intake manifold after removing the carburetor.
_____ c. Place a note on the steering wheel of the vehicle stating that you have removed the carburetor.
_____ d. Wear protective gloves, an apron, and eye protection when working with carburetor cleaner.
_____ e. Match fuel fitting threads at a slight angle for a stronger connection.
_____ f. When working on a vehicle's fuel system, make sure that a Class B fire extinguisher is nearby.

2. Identify each of the parts labeled in the illustration below by writing the letter of the correct part name in the proper blank.

_____ 1.
_____ 2.
_____ 3.
_____ 4.
_____ 5.
_____ 6.

Parts

a. choke assembly
b. throttle body
c. fast idle screws
d. air horn
e. throttle body gasket
f. mainwell inserts
g. pump piston gasket
h. air horn gasket
i. float bowl
j. idle mixture screws

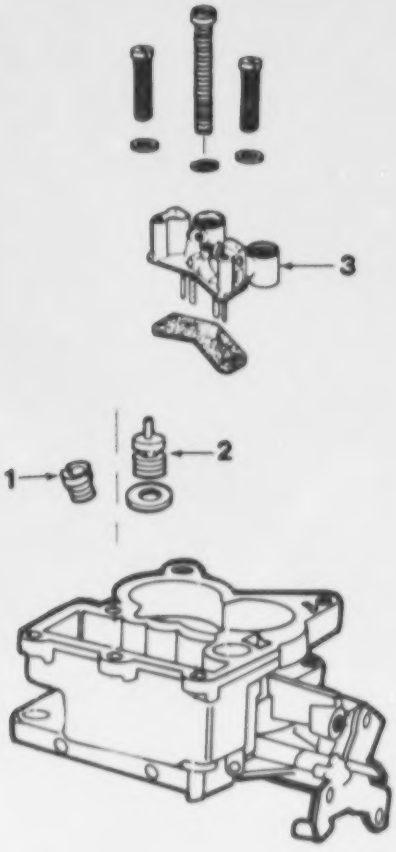


3. Identify each of the parts labeled in the illustration below by writing the letter of the correct part name in the proper blank.

Parts

_____ 1.
_____ 2.
_____ 3.

a. mainwell insert
b. main jet
c. gasket
d. venturi cluster
e. power valve
f. attaching screw



4. The steps for disassembling a carburetor are listed out of order below. Write the letter of each step beside the proper number to show the correct sequence.

Order	Steps
_____ 1.	a. Remove the float, power piston, and pump plunger from the air horn.
_____ 2.	b. Remove the carburetor from the engine.
_____ 3.	c. Disassemble the float bowl.
_____ 4.	d. Disassemble the air horn.
_____ 5.	e. Disassemble the throttle body.

5. What is the recommended method for cleaning the vacuum-break diaphragm?

_____ a. Soak the diaphragm in gasoline; then rinse it.
_____ b. Soak the diaphragm in carburetor cleaner; then rinse it.
_____ c. Wipe the diaphragm with a clean cloth.
_____ d. Wipe the diaphragm with an emery cloth.

6. At what point in the assembly of the carburetor is the hot idle compensator installed?

_____ a. during the assembly of the float bowl
_____ b. during the assembly of the throttle body
_____ c. during the assembly of the air horn

7. What parts of the carburetor should be cleaned in carburetor cleaner?

_____ a. all carburetor parts
_____ b. carburetor gaskets and castings
_____ c. carburetor jets, float, and accelerator pump leather
_____ d. all metal parts and castings

8. What is the recommended service procedure for a carburetor float with pin holes?

_____ a. Patch the float.
_____ b. Solder the float.
_____ c. Replace the float.

9. How should the idle mixture screws be installed during carburetor assembly?

_____ a. The screws should be tightened securely and then backed out two turns.
_____ b. The screws should be seated lightly and then backed out two turns.
_____ c. The screws should be turned in about halfway and then backed out two turns.

10. When checking the pump discharge for proper operation, where on the carburetor should there be fuel flow?

_____ a. at the main jets into the venturi bores
_____ b. at the hot idle compensator valve
_____ c. at the choke valve into the air horn
_____ d. at the mainwell inserts into the throttle body

11. What should the pump plunger assembly be soaked in before installation?

_____ a. carburetor cleaner
_____ b gasoline
_____ c. lightweight engine oil
_____ d. clean water

12. How is the choke valve attached to the choke shaft on most late-model carburetors?

_____ a. The choke valve screws are staked to the choke shaft.
_____ b. The choke valve screws are peened to the choke shaft.
_____ c. The choke valve screws are riveted to the choke shaft.

13. When installing a choke valve, how should the side with the trademark or markings be positioned?

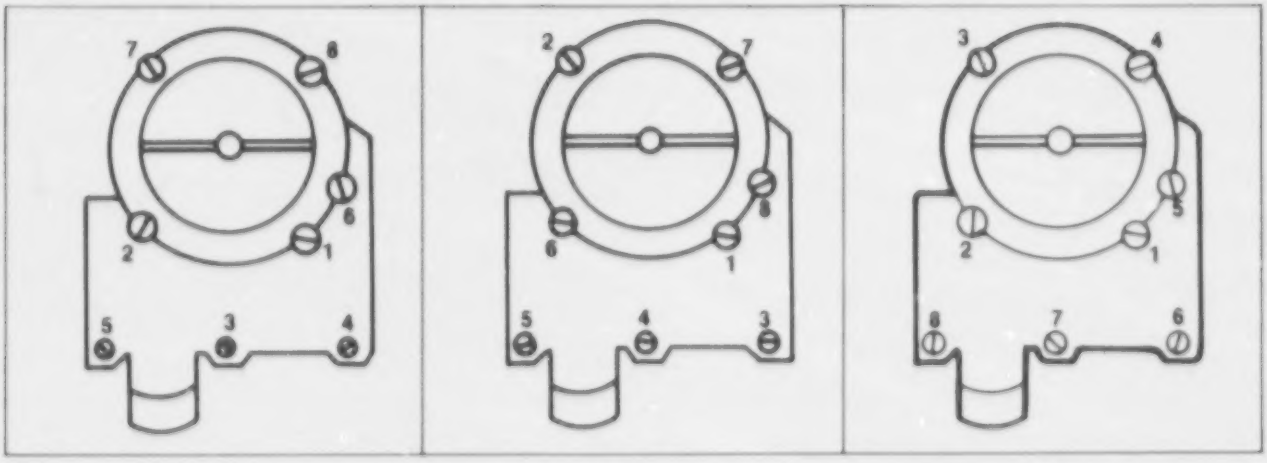
_____ a. facing down (or in)
_____ b. facing up (or out)

14. When adjusting the float, what clearance should be checked last?

_____ a. float drop
_____ b. float level

15. Which of the three illustrations below shows a correct tightening sequence for assembling a carburetor?

_____ a. A
_____ b. B
_____ c. C



A B C

From *Delco Carburetor Parts Service Manual*. ©1973 General Motors Corporation. Used with permission of Delco-Remy Division, General Motors Corporation.

16. When installing a paper fuel inlet filter, which end should be facing the fuel inlet opening?

_____ a. the large opening
_____ b. the small opening
_____ c. the gasket end

17. When adjusting the accelerator pump rod, how are the throttle valves shut?

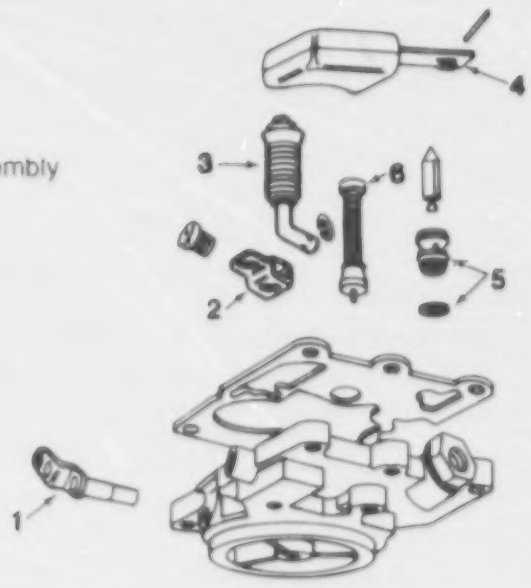
_____ a. by bending the fast idle cam tang
_____ b. by holding the pump rod by hand
_____ c. by holding down the choke piston lever
_____ d. by backing out the throttle stop screw and fast idle screw

18. What is the critical clearance to check when adjusting the fast idle cam?

_____ a. the gap between the choke valve and the air horn inner wall
_____ b. the gap between the fast idle screw and the fast idle cam
_____ c. the gap between the throttle valve and the throttle body
_____ d. the gap between the unloader cam and the highest step on the fast idle cam

19. Identify each of the parts labeled in the illustration below by writing the letter of the correct part name in the proper blank.

	Parts
_____ 1.	a. pump plunger
_____ 2.	b. mainwell insert
_____ 3.	c. float pin
_____ 4.	d. inner pump lever
_____ 5.	e. float needle and seat assembly
_____ 6.	f. main jet
	g. power piston
	h. fast idle cam
	i. float
	j. pump lever



20. The steps for assembling the air horn are listed out of order below. Write the letter of each step beside the proper number to show the correct sequence.

Order	Steps
_____ 1.	a. Install the power piston.
_____ 2.	b. Install the choke piston lever assembly.
_____ 3.	c. Make all the float adjustments.
_____ 4.	d. Install the accelerator pump.
_____ 5.	e. Install the choke housing and gasket.
_____ 6.	f. Install the float.

After you finish this pretest, carefully tear it out of the book and give it to your instructor. After s(he) has checked your answers, your instructor will direct you either to practice the work activities or to study the material covered by this test.

EXERCISE 21

1. What is a "well-ventilated" room?

   _____

2. Should your work area have plenty of ventilation when you're working with fuel? _____

3. _____ flexible fuel lines before disconnecting them.

4. _____ steel fuel lines before disconnecting them.

5. How could an extension light cause a fire or explosion?

   _____

6. If your hair is longer than a conventional length, what can you do to protect it when you work around an operating engine?

   _____

7. What kind of wrench should you use to loosen or tighten a fuel fitting?

   _____

8. When you're trying to connect fuel fittings, _____ the threads _____.

9. List four things that can protect you from solutions that can burn you.

   a. _____

   b. _____

   c. _____

   d. _____

10. What should you do to the intake manifold after you've removed the carburetor?

    _____

11. After you've removed the carburetor, you should place a note on the steering wheel stating that

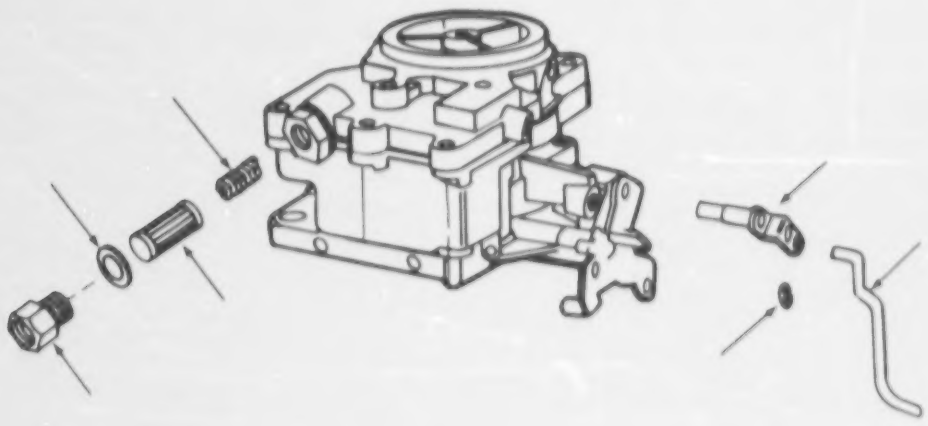
    _____

12. The steps for disassembling a carburetor are listed out of order below. Place a *1* next to the first step, a *2* next to the second step, and so on, to show the correct order.

    _____ a. Disassemble the air horn.
    _____ b. Find the correct carburetor overhaul section in a technical service manual for the model and make of carburetor you're working on.
    _____ c. Remove the float assembly, power piston, pump plunger, and lever from the air horn.
    _____ d. Disassemble the float bowl and the throttle body.
    _____ e. Find an exploded diagram of the carburetor you're working on.

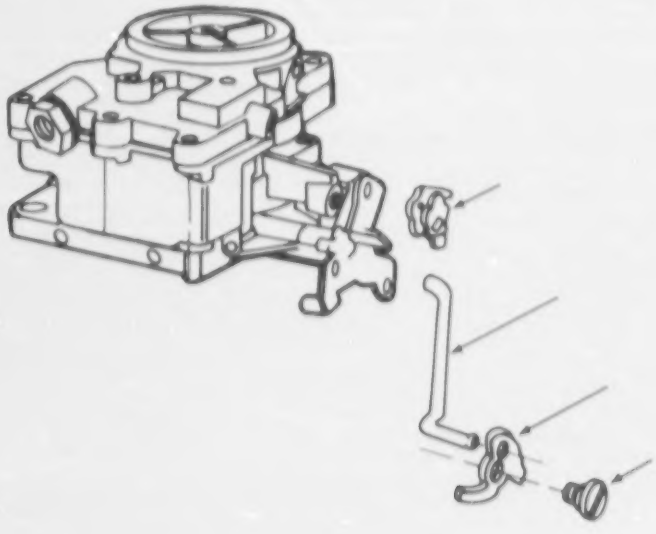
13. Label these carburetor parts by letter on the diagram below:

a. fuel inlet fitting
b. inlet gasket
c. fuel filter
d. inlet spring
e. pump rod
f. upper retaining clip
g. pump lever



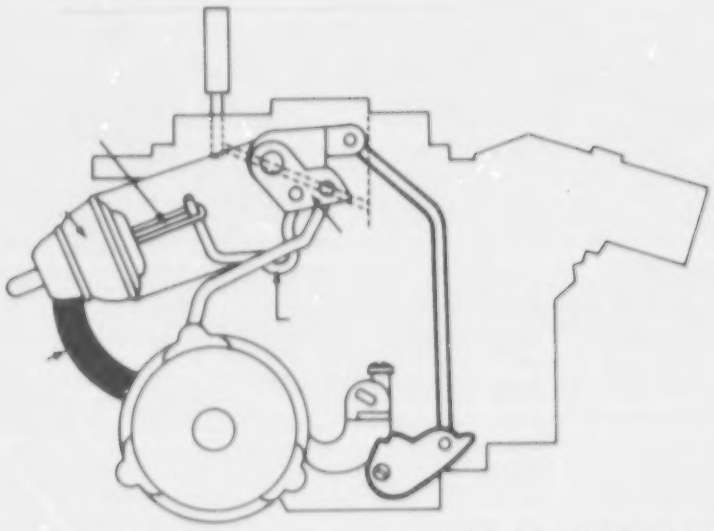
14. Label these carburetor parts by letter on the diagram below:

a. fast idle cam screw
b. fast idle cam
c. choke rod
d. choke lever



15. Label these parts by letter on the diagram below:

a. vacuum-break hose
b. vacuum break
c. vacuum-break rod
d. choke lever
e. diaphragm plunger shaft

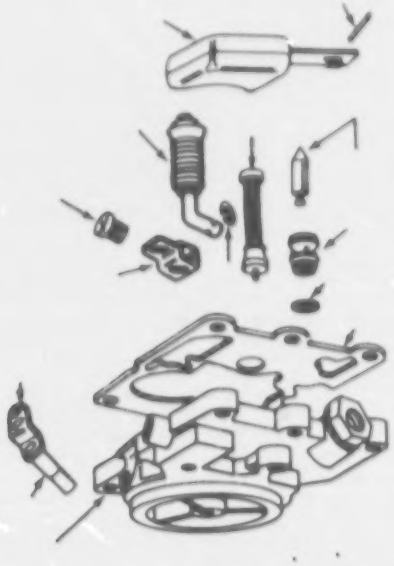


16. What should you do with the carburetor air horn parts as you remove them from the carburetor?

_____

17. Label these parts by letter on the diagram below:

a. air horn
b. float pin
c. float needle seat assembly
d. float needle seat gasket
e. power piston
f. pump plunger
g. set screw
h. inner pump lever
i. outer pump lever
j. shaft
k. air horn gasket

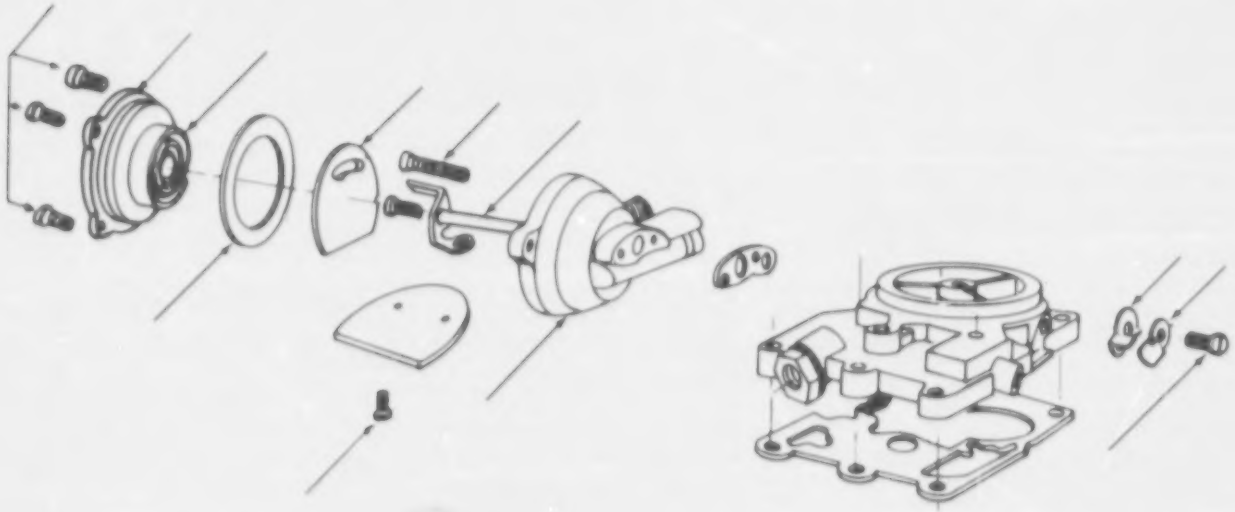


18. What should you do with the float assembly parts as you remove them from the carburetor?

_____

19. Label these parts by letter on the diagram below:

a. retainer screws
b. retainer
c. choke cover
d. coil assembly
e. inner gasket
f. baffle plate
g. choke valve retaining screw
h. choke lever screw
i. trip lever
j. choke lever
k. choke shaft
l. choke housing
m. choke housing screws
n. choke housing gasket

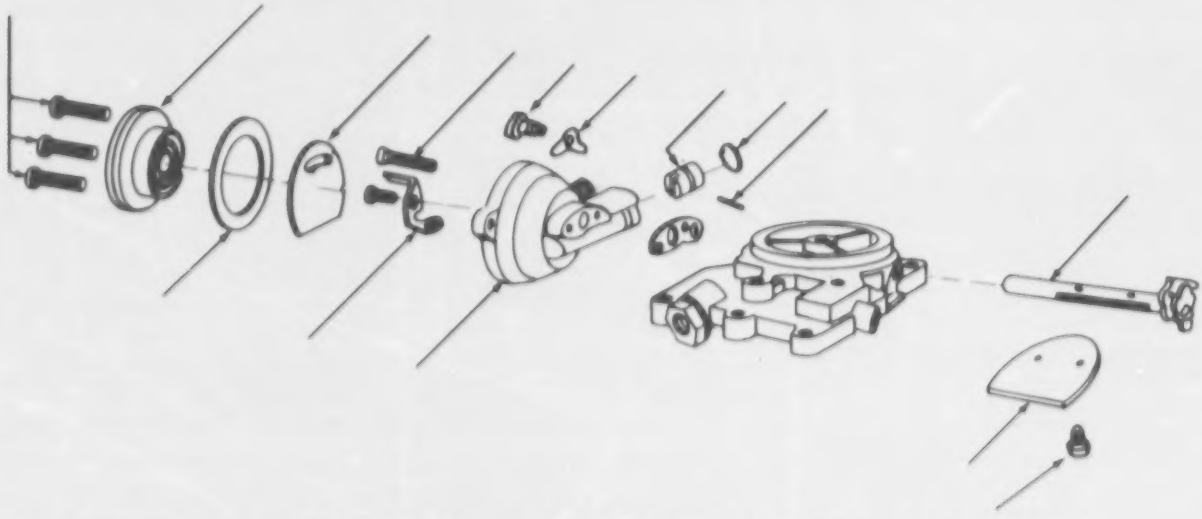


20. Is the external choke lever linkage shown in Question 17 peened to the shaft or attached with a screw? _____

_____

21. Label these parts by letter on the diagram below:

a. choke cover screws
b. choke cover
c. coil assembly
d. inner gasket
e. baffle plate
f. choke piston lever screws
g. choke lever
h. choke piston
i. piston pin
j. housing plug
k. retaining screw
l. retainer
m. choke housing screw
n. choke housing
o. choke housing gasket
p. choke valve retaining screw
q. choke valve
r. choke shaft

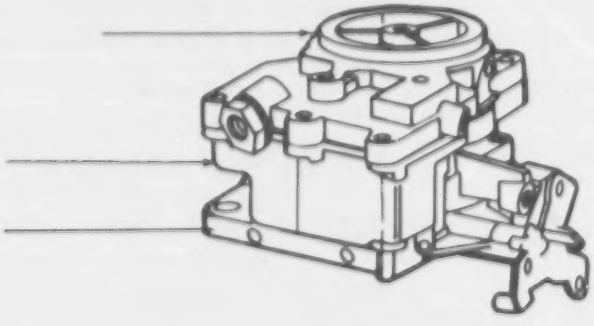


22. What should you do with the choke assembly parts as you remove them from the carburetor?

_____

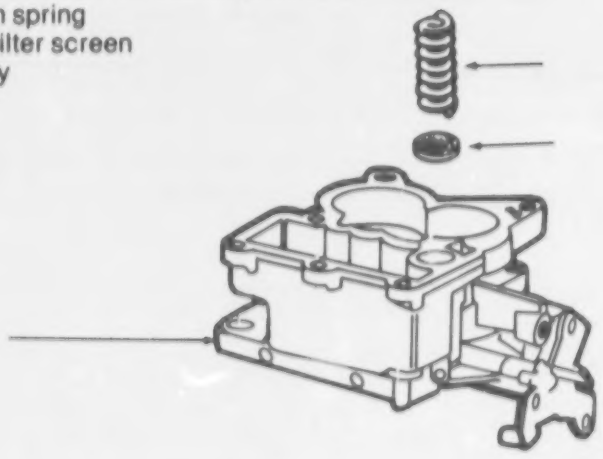
23. Label these parts by letter on the diagram below:

a. air horn b. throttle body c. float bowl



24. Label these parts by letter on the diagram below:

a. pump return spring
b. pump inlet filter screen
c. throttle body



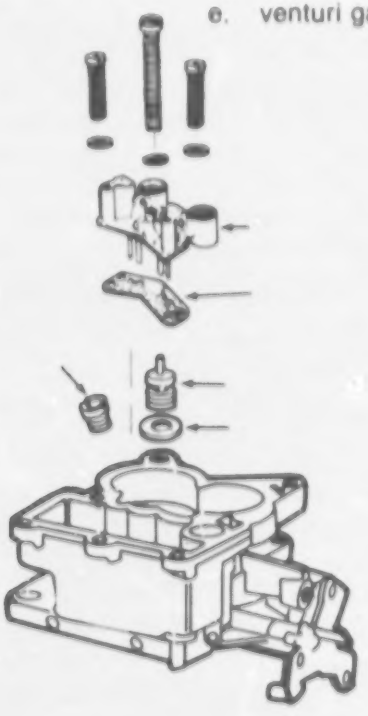
25. What should you do to the float bowl if you want to remove the intake check ball?

_____

_____

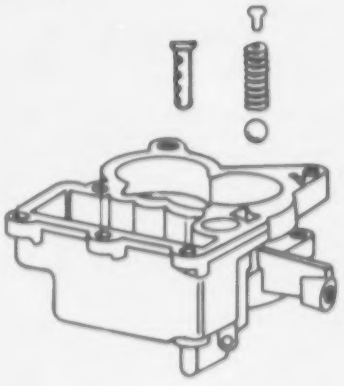
26. Label these parts by letter on the diagram below:

a. main jet
b. power valve
c. gasket
d. venturi cluster
e. venturi gasket



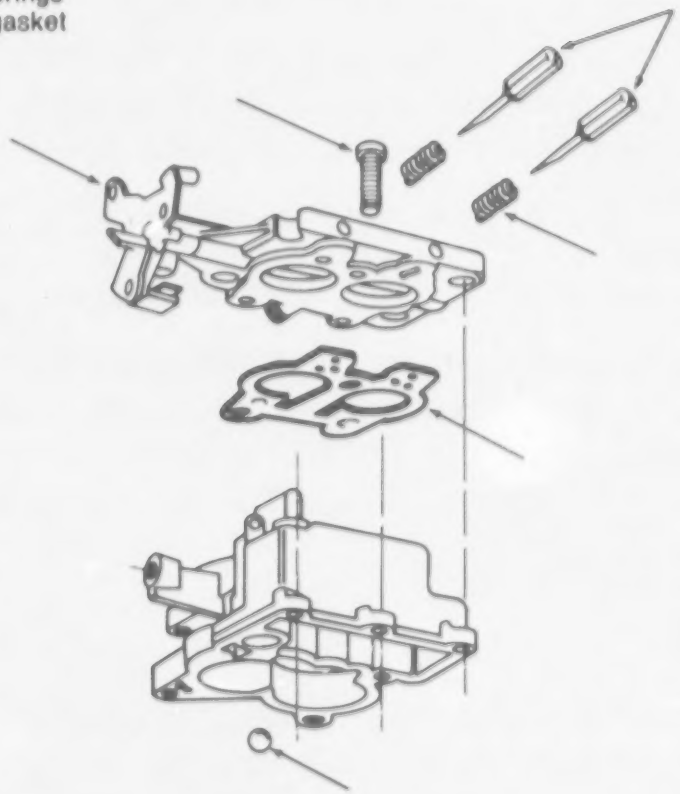
27. Label these parts by letter on the diagram below:

a. mainwell insert
b. retainer guide
c. pump discharge return spring



28. Label these parts by letter on the diagram below:

a. pump discharge check ball
b. screws attaching the throttle body to the float bowl
c. throttle body
d. idle mixture screws
e. idle mixture springs
f. throttle body gasket



29. What should you do with the float assembly parts, the throttle valve body, and the idle mixture screws as you remove them from the carburetor?

_____

30. The following parts must be disassembled. Place a *1* by the part that should be disassembled first, a *2* by the part that should be disassembled second, and so on.

_____ a. float assembly
_____ b. power piston
_____ c. pump lever
_____ d. choke assembly
_____ e. float bowl
_____ f. throttle body

Turn to the back of the book and check your answers for Exercise 21.

EXERCISE 22

1. Place a check (✓) by the parts below that can be safely cleaned with carburetor cleaner.

   _____ a. plastic parts
   _____ b. neoprene parts
   _____ c. rubber parts
   _____ d. electrical parts
   _____ e. switches and relays
   _____ f. gaskets
   _____ g. choke cover
   _____ h. coil assembly
   _____ i. pump plunger
   _____ j. vacuum-break diaphragm
   _____ k. castings
   _____ l. metal parts

2. How long should carburetor parts be soaked in carburetor cleaning solvent? _____

3. To clean the carburetor parts, place the parts in a _____ _____ that comes with the cleaner. Then slowly lower the _____ into the cleaner. Always place the cleaner _____ back over the cleaner.

4. How should you clean jets, nozzles, or other passages?

   _____

   _____

   _____

5. What's wrong with using drills or wires to clean jets or nozzles?

   _____

6. Clean the vacuum break with a _____.

7. To test the vacuum break with a vacuum-break tester, do the following:

   a. Apply _____ psi to the diaphragm.

   b. If the vacuum pump tester gauge shows a steady or quick drop in psi, _____ the diaphragm unit.

8. Place a check (✓) by each of the parts you should inspect for wear and damage.

   _____ a. diaphragm unit
   _____ b. float and pin holes
   _____ c. idle mixture needles
   _____ d. linkage
   _____ e. linkage arms
   _____ f. throttle valves
   _____ g. throttle shaft

9. Shake the _____ to check for leaks.

10. Be sure the _____ _____ move freely.

Turn to the back of the book and check your answers for Exercise 22.

91

EXERCISE 23

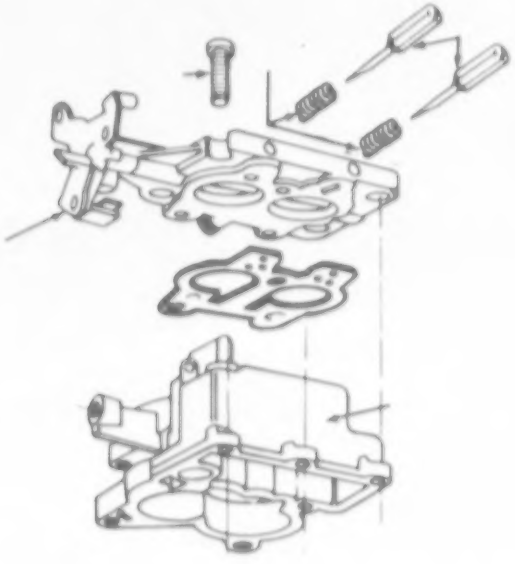
1. Place a check (✓) by the parts that are usually included in a carburetor tune-up kit.

_____ a. fuel filter	_____ f. pump assembly
_____ b. jets	_____ g. pump check balls
_____ c. gaskets	_____ h. pump check ball spring
_____ d. float bowl	_____ i. mixture screws
_____ e. needle and seat	_____ j. washers

2. Always replace the old _____ with a new one when you overhaul the carburetor.

3. Label these parts by letter on the diagram below:

a. idle mixture springs
b. idle mixture screws
c. float bowl
d. throttle body
e. throttle body assembly
f. screw and lockwasher



4. Complete the steps needed to reassemble the throttle body:

   a. Install the idle mixture _____ and _____. Then lightly seat the idle mixture _____.

   b. Back the mixture screws out for _____ turns.

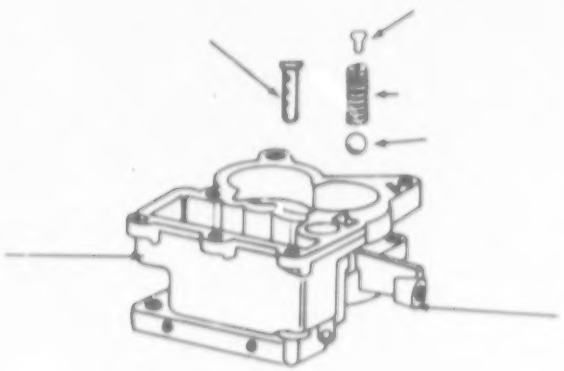
   c. Turn the _____ _____ upside down. Then place a new throttle body _____ over the locating dowels.

   d. Install the throttle body assembly over the _____.

   e. Tighten the _____ _____ evenly and securely.

5. Label these parts in the diagram below:

   a. mainwell insert tube
   b. float bowl
   c. throttle body
   d. pump discharge check ball
   e. spring
   f. retainer



6. Do all carburetors have mainwell insert tubes?_____

7. In what order should you install the pump discharge check ball, spring, and T-shaped retainer?

   1. _____

   2. _____

   3. _____

8. What's the difference between the pump discharge check ball and the inlet check ball?

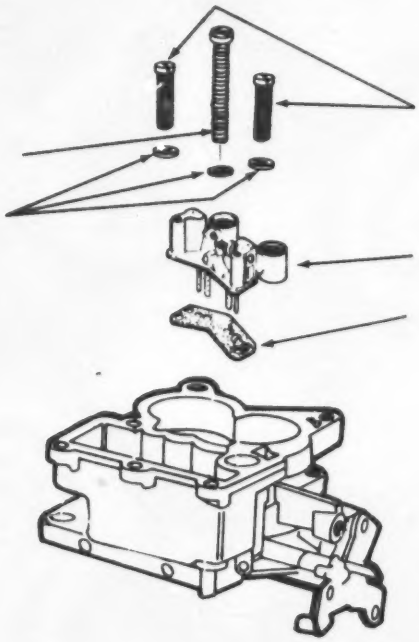
   _____

   _____

9. The top of the _____ for the pump discharge check ball should be flush with the top of the float bowl.

10. Label these parts by letter on the diagram below:

a. venturi gasket
b. venturi cluster
c. washers
d. outside screws
e. center screw

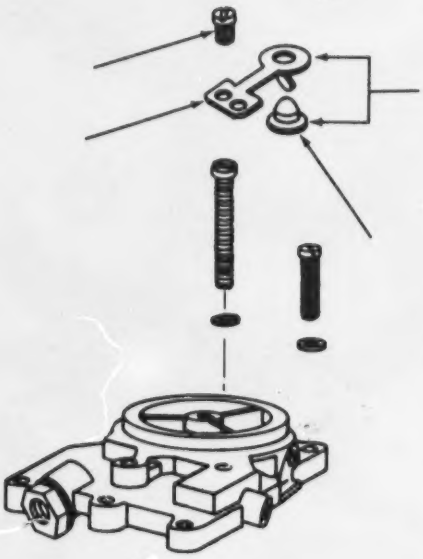


11. Which screw shown in Question 10 has a smooth shank? _____

12. Label the hot idle air compensator in the diagram below:

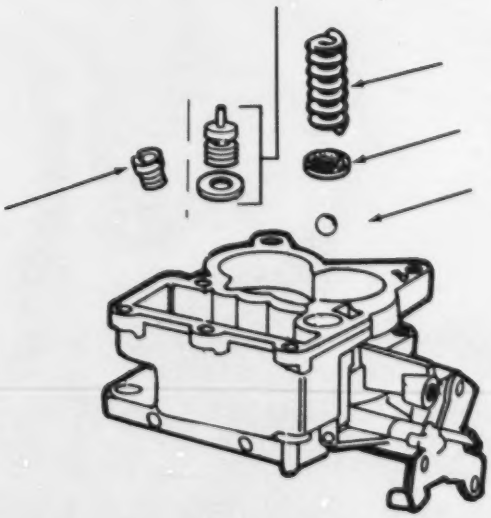
13. Label these parts by letter on the diagram below:

a. idle vent valve assembly
b. idle vent valve
c. idle vent valve holder
d. attaching screw



14. Label these parts by letter on the diagram below:

a. main metering jet
b. power valve and gasket assembly
c. inlet check ball
d. inlet screen
e. pump return spring



15. Do all carburetors have an inlet screen? _____

16. To check the pump discharge:

    a. fill the pump well with _____

    b. put the pump _____ into the well

    c. force the _____ up and down several times

    d. check the discharge from each _____ into the venturi _____

17. How should you lubricate the accelerator pump lever?

    _____

18. In what order should you install the choke housing, choke housing gasket, and attaching screws?

    1. _____

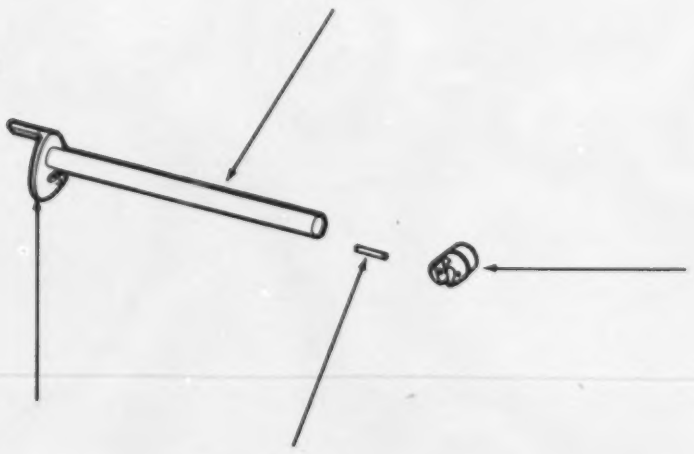
    2. _____

    3. _____

For Questions 19-21, assume that the choke piston lever assembly is riveted to the choke shaft.

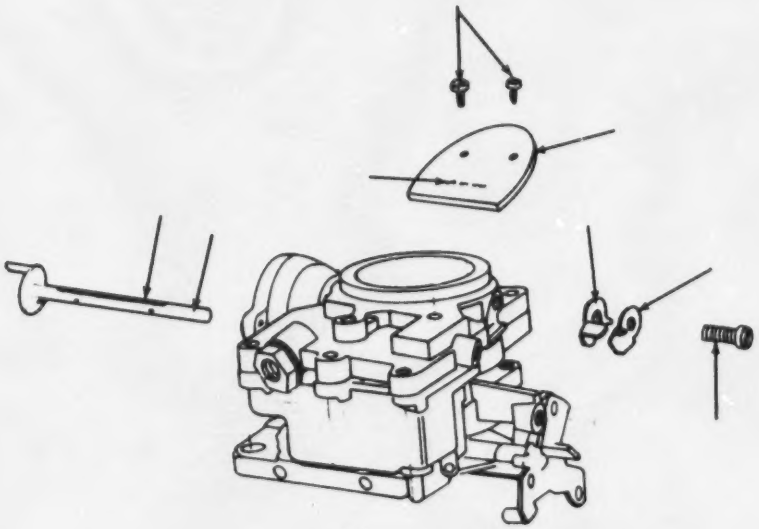
19. Label these parts by letter on the diagram below:

    a. choke piston lever
    b. choke shaft
    c. choke piston pin
    d. choke piston



20. Label these parts by letter on the diagram below:

a. choke piston
b. choke shaft
c. choke lever
d. trip lever
e. choke valve
f. trademark
g. retaining screws
h. choke lever screw



21. Complete the following statements:

a. The choke piston is connected to the choke piston lever with a _____.

b. The choke lever is riveted to the _____ _____.

c. The choke shaft slides through the bores in the _____ _____.

d. The choke lever and trip lever are connected to the air horn with a _____.

e. The choke valve slides into the _____ _____.

f. The trademark is in the _____ position when the choke valve is closed.

g. The choke valve is connected to the choke shaft with two _____ _____.

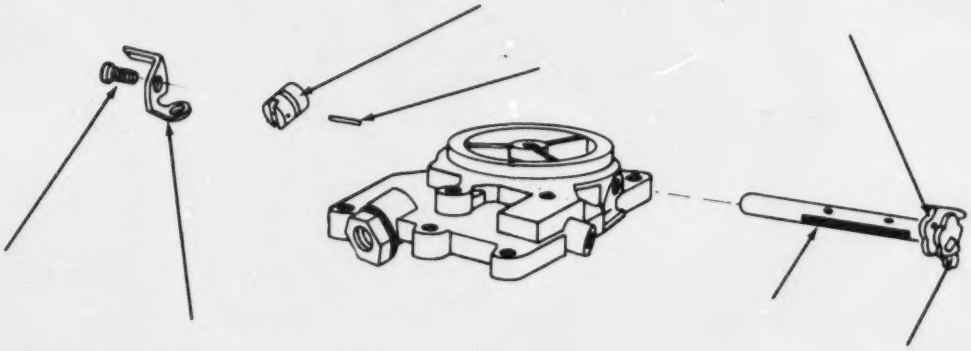
h. Do not tighten the retaining screws until the choke valve and shaft are _____.

100

For Questions 22-23, assume that the choke trip lever is staked onto the choke shaft.

22. Label these parts by letter on the diagram below:

a. choke lever
b. trip lever
c. choke shaft
d. choke piston lever
e. choke piston
f. choke piston pin
g. attaching screw



23. Complete the following statements:

a. Slide the _____ _____ through the bores in the air horn.

b. Connect the piston to the choke piston lever with a _____.

c. Connect the choke piston assembly to the air horn with a _____.

d. Slide the choke valve into the _____ _____.

e. Be sure the trademark is in the _____ position when the choke valve is closed.

24. To center the choke valve and choke shaft, do the following:

a. Turn the choke valve to the _____ position.

b. Place a _____-inch feeler gauge between the choke trip lever and the upper choke lever.

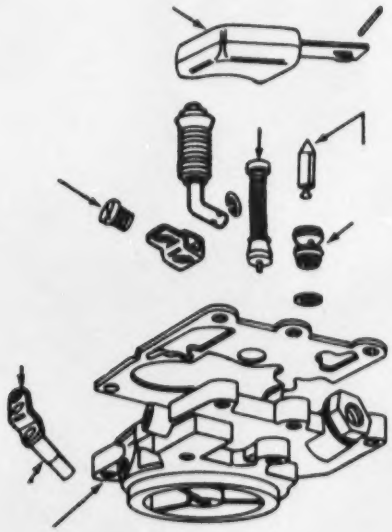
c. Keep a _____-inch clearance while centering the choke shaft.

d. Tighten and _____ _____ the retaining screws.

e. Be sure the choke _____ moves freely inside the housing.

25. Label these parts in the diagram below:

a. float
b. outer pump lever
c. pump shaft
d. set screw
e. power piston assembly
f. needle and seat assembly



26. What do you need to do to the pump shaft before you install it in the air horn?

a. _____

b. _____

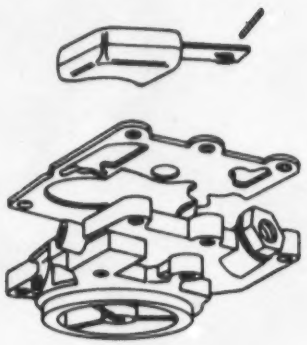
27. To secure the shaft, tighten the retaining screw against the _____.

28. What should you do to the power piston after you insert it in the air horn? _____.

29. To secure the needle and seat assembly, tighten it securely with a _____ _____.

30. Label the parts by letter in the diagram below:

a. cover gasket
b. float assembly
c. retaining pin



31. Secure the float assembly in the air horn by using a _____ _____.

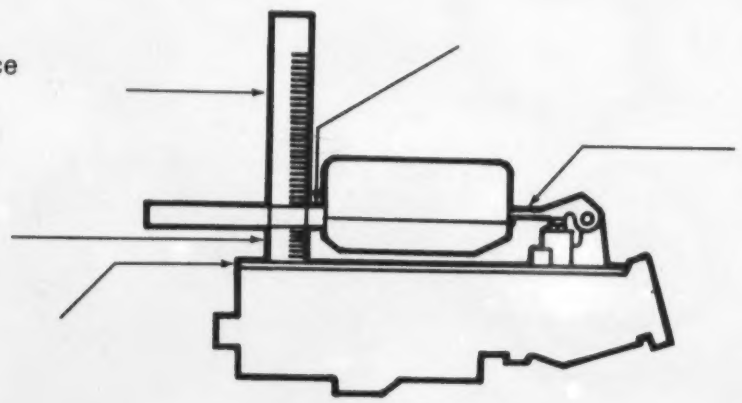
32. What should you use when you adjust the float level?

a. the _____ _____ specification

b. a _____ to measure the distance from the _____ to the _____ or _____ on the free end of the float

33. Label these terms by letter on the diagram below.

a. gasket
b. lip or notch
c. gauge
d. measure this distance
e. bend here to adjust



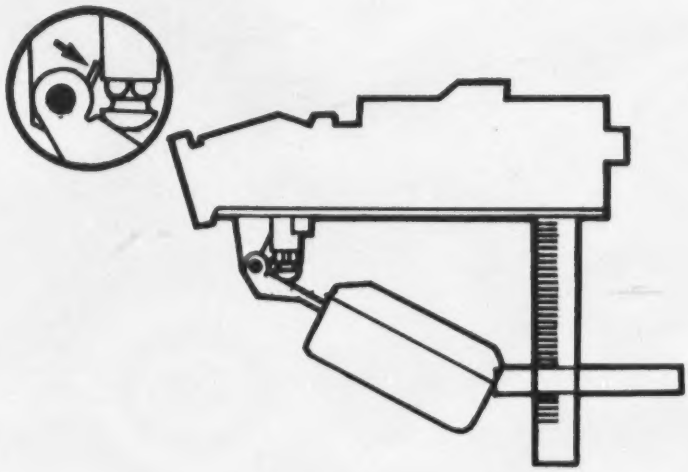
34. What should you use when you adjust the float drop?

a. the _____ _____ specification

b. a _____ to measure the distance from the _____ to the _____ or _____ on the free end of the float

35. Label these terms by letter on the diagram below:

a. gasket
b. lip or notch
c. gauge
d. measure this distance
e. tang
f. bend here to adjust
g. needle and seat assembly



36. When you adjust the float level, the carburetor air horn should be:

_____ a. right side up
_____ b. upside down

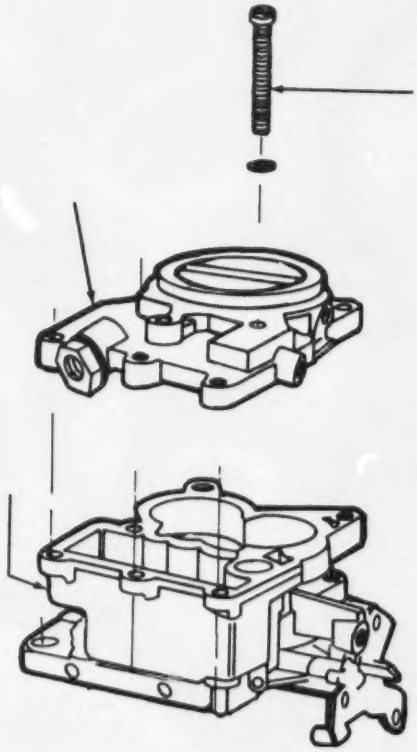
37. When you adjust the float drop, the carburetor air horn should be:

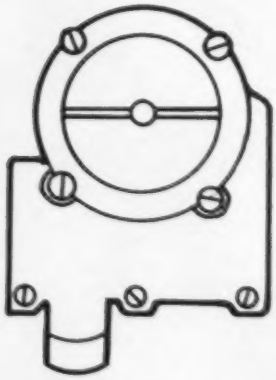
_____ a. right side up
_____ b. upside down

38. Check all correct answers. When you adjust the float drop, be sure that:

_____ a. the needle does not wedge on the gauge
_____ b. the needle does not wedge in the seat
_____ c. the float swings from side to side
_____ d. the float stays in a straight line with the air horn

39. Below are two illustrations. Follow the directions under each illustration.





Adapted from *Delco Carburetor Parts Service Manual.*
©1973 General Motors Corporation.

(1) Label these parts in the diagram above.

a. air horn assembly
b. float bowl
c. longer air horn screw

(2) Label the longer air horn screw in the above diagram.

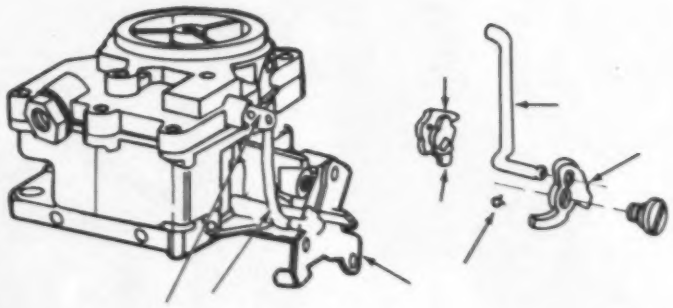
(3) Number each screw from 1 to 7 to show which screw should be tightened first, second, and so on.

40. Check all correct answers. When you install the air horn assembly on the float bowl assembly, you should:

_____ a. mount the float bowl with the throttle body onto a stand or vise
_____ b. use lockwashers with the air horn screws
_____ c. tighten the air horn screws, starting with the longer air horn screw

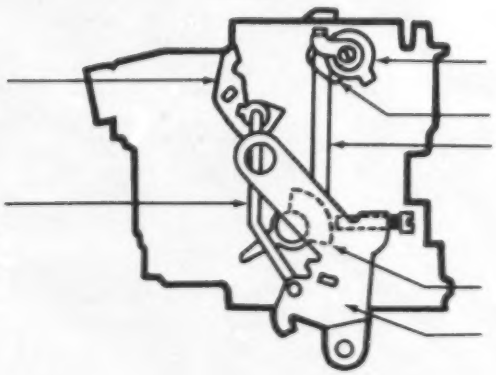
41. Label these parts by letter on the diagram below:

a. pump lever
b. pump rod
c. attaching clip
d. upper choke lever
e. throttle body
f. trip lever
g. choke rod
h. fast idle cam



42. Label these parts by letter on the diagram below:

a. pump lever
b. pump rod
c. choke lever
d. trip lever
e. choke rod
f. fast idle cam
g. throttle body



43. Write the name of the part in the proper blank to indicate the order in which the pump rod, choke rod, and fast idle cam should be installed.

1. _____ (align one end with the pump lever)

2. _____ (place one end in the upper choke lever and align it with the hole in the lever)

3. _____ (slip it onto the lower end of the choke rod and attach it with a screw)

44. Complete the following statements:

a. Install the _____ for the idle stop solenoid, if one is used.

b. If the fuel filter is paper, be sure the _____ end of the filter faces the fuel inlet fitting.

c. Install the choke cover baffle plate and gasket, the choke coil and cover, the retainer, and the retaining screws or clips, and set the choke housing according to the _____

_____.

45. To adjust the accelerator pump rod:

a. back out the throttle stop screw and the fast idle screw so that the throttle valves are _____

b. measure the distance from the top of the air horn _____ to the top of the _____ _____ _____ according to the _____

_____

c. then _____ the accelerator pump rod at its curve to meet the specifications.

46. Check all correct answers. Other adjustments you may need to make include those for the:

_____ a. fast idle
_____ b. unloader
_____ c. choke rod (fast idle cam)
_____ d. intermediate choke rod
_____ e. primary vacuum break
_____ f. auxiliary vacuum break

Turn to the back of the book and check your answers for Exercise 23.

PERFORMANCE CHECKLIST—P.O. 31

The instructor will provide a carburetor. Clean and overhaul the carburetor. All of the performances below must be accomplished.

STUDENT PERFORMANCES

1. Disassembles carburetor.
2. Cleans and inspects parts for damage or wear.
3. Replaces any worn or defective parts.
4. Reassembles throttle body, float bowl, and air horn assemblies.
5. Adjusts float bowl assembly.
6. Installs air horn assembly.
7. Completes carburetor assembly.
8. Makes all necessary adjustments according to manufacturer's specifications.
9. Uses appropriate tools and equipment.
10. Follows all appropriate safety precautions.
11. Performs tasks in an acceptable amount of time.

INSTRUCTOR RATINGS

ACCEPTABLE		NOT ACCEPTABLE		OMIT

Keep a copy of this checklist for your records.

P.O. 32 PRETEST

NAME _____

1. Check (✓) all the safety practices listed below that you should follow.
   - _____ a. Check the stability of a vehicle on a hydraulic lift by rocking the vehicle back and forth.
   - _____ b. Wear eye protection when working beneath a vehicle.
   - _____ c. Select and use the correct size of sockets and wrenches.
   - _____ d. Wear very loose clothing to allow for easy movement.
   - _____ e. Support a vehicle with jack stands of the correct capacity after raising the vehicle with a jack.
   - _____ f. Use fender covers only when you are wearing a belt.

2. The manifold heat control valve is also called the:
   - _____ a. heat stove
   - _____ b. diverter valve
   - _____ c. heat riser valve
   - _____ d. gulp control valve

3. The purpose of the manifold heat control valve is to:
   - _____ a. cool the air-fuel mixture before it enters the cylinders
   - _____ b. heat the exhaust gases for better exhaust flow
   - _____ c. recirculate unburned exhaust gases through the carburetor
   - _____ d. heat the air-fuel mixture in the intake manifold until the engine warms up

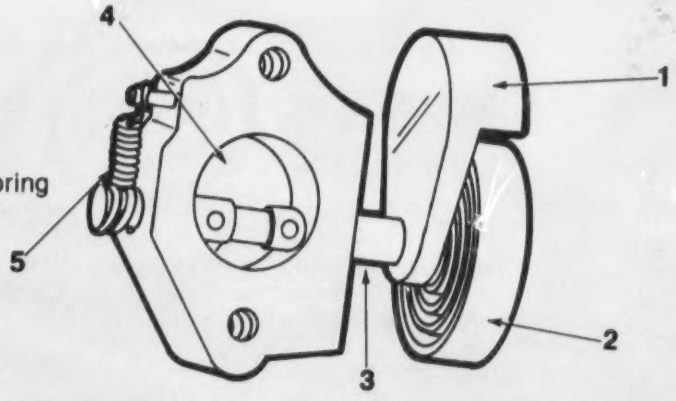
4. Which engine type usually has the manifold heat control valve located in the manifold?
   - _____ a. a V-8 engine
   - _____ b. a 4- or 6-cylinder engine

5. Identify each of the parts in the illustration below by writing the letter of the correct part in the proper blank.

   Parts

   - _____ 1.
   - _____ 2.
   - _____ 3.
   - _____ 4.
   - _____ 5.

   a. valve shaft
   b. anti-rattle spring
   c. counterweight
   d. butterfly valve
   e. thermostatic coil spring
   f. diverter
   g. gulp valve



6. Place a check (✓) beside the malfunctions that are common for manifold heat control valves.
   - _____ a. valve that moves back and forth too easily
   - _____ b. loose valve shaft
   - _____ c. rusted counterweight
   - _____ d. stuck or frozen valve

7. When inspecting a manifold heat control valve for correct operation, which of the following checks should you make?

_____ a. Rapidly accelerate the engine and watch for movement of the counterweight.
_____ b. Listen for exhaust gas flow from the tail pipe while the engine is running.
_____ c. Note RPM drop as engine is accelerated when it is cold and then when it is hot.
_____ d. Measure the vacuum at the intake manifold.

8. The correct material to use for freeing a stuck manifold heat control valve is:

_____ a. penetrating oil
_____ b. heat riser valve lubricant
_____ c. heat-resistant lubricant
_____ d. silicone spray

9. As a general rule, a badly seized manifold heat control valve will:

_____ a. leak exhaust gases after being freed
_____ b. operate properly after being freed
_____ c. become stuck again very quickly after being freed
_____ d. not be able to be freed

10. If a manifold heat control valve is loose in a 6-cylinder engine:

_____ a. the exhaust manifold will probably need replacement also
_____ b. the intake manifold will probably need replacement also
_____ c. the problem can usually be corrected by simply replacing the valve shaft

11. The steps for replacing a manifold heat control valve on a V-8 engine are listed out of order below. Write the letter of each step beside the proper number to show the correct sequence.

Order	Steps
_____ 1.	a. Pull up the exhaust pipe and attach new brass nuts.
_____ 2.	b. Scrape off the old gasket material from the exhaust manifold and exhaust pipe flanges.
_____ 3.	c. Tighten the nuts securely.
_____ 4.	d. Install the new gaskets and the heat control valve
_____ 5.	e. Check for proper operation of the manifold heat control valve

12. The steps for removing a manifold heat control valve on a 6-cylinder engine are listed out of order below. Write the letter of each step beside the proper number to show tte correct sequence.

Order	Steps
_____ 1.	a. Remove the nut and bolt securing the counterweight to the valve shaft.
_____ 2.	b. Pull the valve shaft from the butterfly valve through the manifold.
_____ 3.	c. Separate the intake and exhaust manifolds if necessary.
_____ 4.	d. Remove the thermostatic spring, anti-rattle spring, and retainer.
_____ 5.	e. Slide the lock out and remove the counterweight.

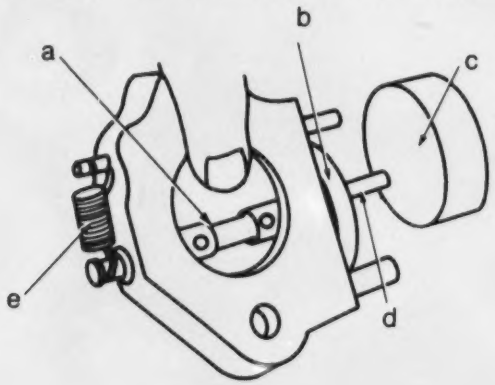
After you finish this pretest, carefully tear it out of the book and give it to your instructor. After s(he) has checked your answers, your instructor will direct you either to practice the work activities or to study the material covered by this test.

EXERCISE 24

1. The manifold heat control valve is also called a _____ _____.

2. On a V-8 engine, the manifold heat control valve is located between the _____ _____ _____ and the _____ _____ _____.

3. Identify the parts of the manifold heat control valve shown below.



a. _____ d. _____

b. _____ e. _____

c. _____

4. The function of the manifold heat control valve is to:
   - _____ a. mix the exhaust gases with the air-fuel mixture during cold engine start-up
   - _____ b. direct hot exhaust gases to the exhaust pipe during engine warm-up
   - _____ c. direct hot exhaust gases around the intake manifold during engine warm-up
   - _____ d. direct air-fuel mixtures around the hot exhaust gases during engine warm-up

5. The purpose of the manifold heat control valve is to:
   - _____ a. increase the vaporization of air-fuel mixtures when the engine is cold
   - _____ b. increase the vaporization of air-fuel mixtures when the engine is hot
   - _____ c. increase the flow of air-fuel mixture when the engine is cold
   - _____ d. increase the flow of air-fuel mixture to the exhaust pipe when the engine is hot

6. On a 6-cylinder engine, the manifold heat control valve is located between:
   - _____ a. the exhaust manifold and the engine cylinder head
   - _____ b. the exhaust manifold and the intake manifold
   - _____ c. the exhaust manifold and the exhaust pipe
   - _____ d. the exhaust pipe and the muffler

7. One way to see if the manifold heat control valve is operating properly is to _____ the engine and watch the _____ to see that it moves.

8. Another way to see whether the manifold heat control valve is operating properly is to flip the _____ back and forth by hand.

9. A common defect found with manifold heat control valves is leakage of _____ _____ past the _____ _____.

10. A part used on some engines to reduce the rattling of the manifold heat control valve is called a/an _____ _____.

Turn to the back of the book and check your answers for Exercise 24.

EXERCISE 25

1. To free a manifold heat control valve that is stuck, first spray both ends of the shaft with:
   _____ a. penetrating oil
   _____ b. special heat riser valve lubricant
   _____ c. grease
   _____ d. parts solvent

2. Then work the valve back and forth by hand by moving the:
   _____ a. anti-rattling spring
   _____ b. counterweight
   _____ c. manifold heat control valve
   _____ d. thermostatic coil spring

3. If the valve is severely stuck, tap the valve shaft back and forth, using a/an _____ _____.

4. Generally, once you have freed a stuck valve, the valve will leak _____ _____ and will need to be _____.

5. To replace a manifold heat control valve on a V-8 engine:

   a. use _____ _____ to soak the nuts and bolts that secure the valve between the exhaust manifold and the exhaust pipe

   b. remove the nuts and bolts, using the proper _____ socket, ratchet, and extension

   c. pull down on the _____ _____ and remove the manifold heat control valve assembly

   d. scrape off all the old _____ from the manifold flange and the exhaust pipe flange

   e. use new gaskets and install the new manifold heat control valve assembly with the counterweight pointing _____

   f. use new _____ nuts on the bolts and tighten them securely

6. To disassemble a manifold heat control valve on a 6-cylinder engine:

a. following the removal of the manifolds, first remove the nuts and bolts that secure the _____ to the valve shaft

b. slide the _____ out of the end of the valve shaft and pry off the _____

c. slip off the _____ _____, the retainer, and the _____ _____ if the valve assembly has one

d. pull the valve _____ out from the _____ through the openings in the manifold.

Turn to the back of the book and check your answers for Exercise 25.

PERFORMANCE CHECKLIST—P.O. 32

The instructor will provide either a live vehicle or live engine. Inspect and repair or replace the manifold heat control valve. All of the performances below must be accomplished.

STUDENT PERFORMANCES	INSTRUCTOR RATINGS				
	ACCEPTABLE		NOT ACCEPTABLE		OMIT
*1. Raises vehicle as necessary.					
2. Inspects manifold heat control valve for proper operation. Notes any defects.					
3. Frees valve if stuck.					
*4. Disconnects and pulls down or removes engine exhaust pipe as necessary.					
5. Removes heat control valve part(s).					
6. Scrapes off old gasket material.					
7. Installs new gaskets and installs heat control valve part(s).					
*8. Connects engine exhaust pipe. (Attaches intake manifold and torques as necessary.)					
9. Performs operational check of heat control valve.					
*10. Lowers vehicle as necessary.					
11. Uses proper tools and equipment.					
12. Follows all appropriate safety precautions.					
13. Performs tasks in an acceptable amount of time.					

*These steps may vary depending upon the particular engine being used.

Keep a copy of this checklist for your records.

ANSWERS TO THE EXERCISES

ANSWERS TO EXERCISE 1

1. a. air cleaner
   b. intake manifold
   c. choke
   d. exhaust manifold
   e. manifold heat control valve
   f vacuum pressure fuel cap
   g. fuel tank
   h. fuel line
   i. charcoal canister
   j. crankcase
   k. fuel pump
   l. canister vent line
   m. carburetor
   n. fuel filter
   o. PCV valve

Now turn to page 5 in your Student Guide.

ANSWERS TO EXERCISE 2

1. The air needs to be clean before it goes through the carburetor and to the engine. Dirt or dust from the air could wear away engine parts or clog up other parts such as the oil filter.
2. a. housing
   b. air filter element
   c. air duct
   d. air duct
3. The air duct is a part through which air flows.
4. paper filter
5. The blast of air could tear the paper in the filter element.
6. The housing should be kept in a safe place to keep it from being stepped on or knocked over.

Now turn to page 13 in your Student Guide.

ANSWERS TO EXERCISE 3

1. a. Disconnect hoses and lines as needed.
   b. Remove the wing nut.
   c. Remove the air cleaner assembly from the vehicle.
   d. Remove the housing cover.
   e. Lift out the paper filter element.
2. a. PCV filter element
   b. carburetor air cleaner
   c. gauze wrapper
   d. paper filter element
   e. paper filter element
   f. sealing edges (gaskets)
3. all of them
4. a. F
   b. F
   c. F
   d. F
   e. T

Now turn to page 17 in your Student Guide.

ANSWERS TO EXERCISE 4

1. a
2. Hold the paper filter element gently but firmly. Tap it lightly on a flat surface to shake off excess dirt and dust.
3. a. wire gauze
   b. housing
   c. cover
4. a. housing
   b. housing cover
   c. PCV filter
   d. hose
   e. wing nut
   f. air horn gasket
5. a. hose clamp
   b. hose
   c. filter retainer clip
6. Reverse the steps used to remove it.
7. Use the technical service manual and look under ***crankcase ventilation.***
8. a. PCV filter
   b. cleaner housing; all hoses, lines, and ducts
   c. air filter element
   d. housing cover
   e. wing nut
9. a. every 12,000 miles
   b. every 30,000 miles
   c. by inspecting, cleaning, and replacing parts as needed

Now turn to page 21 in your Student Guide.

ANSWERS TO EXERCISE 5

1. T
2. T
3. T
4. F
5. F
6. F
7. F
8. A lighted match or cigarette can ignite the fuel or fumes.
9. When you clamp the flexible fuel lines to keep fuel from dripping, you reduce the amount of fuel and fumes in the area. This will make a fuel fire less likely.
10. Same as for Question 9 above.

11. If the light falls and breaks in the middle of a gasoline leak, it would cause an explosion and fire.

12. a. never
    b. control
    c. recommended

Now turn to page 28 in your Student Guide.

ANSWERS TO EXERCISE 6

1. a. (1) an outlet fuel filter at the fuel pump
      (2) an in-line filter, probably located in the fuel line between the carburetor and fuel pump (look at Footnote 2 of the specifications)
   b. (1) after each 30,000 miles
      (2) when it gets too dirty or clogged up
   c. (1) after each 15,000 miles (or after 30,000 miles if the in-line filter is also used)
      (2) when it gets too dirty or clogged up
2. b
3. d
4. a
5. Run the engine for a few minutes to check for leaks.
6. Simply reverse the removal procedures.

Now turn to page 34 in your Student Guide.

ANSWERS TO EXERCISE 7

1. flare-nut wrench
2. A flare-nut wrench will not round off the edges of the fittings.
3. Be sure to match the threads squarely when you connect fittings.
4. F
5. F
6. T
7. F
8. a
9. a
10. a
11. b
12. a
13. a. container marked in fluid ounces
    b. volume hose
    c. hose clamp
    d. fuel pump pressure gauge
    e. carburetor fitting
    f. fuel pump tester hose
    g. fuel line
    h. carburetor

14. a. 45 seconds
    b. one pint
    c. 550 RPM
    d. good (16 ounces = 1 pint)
    e. too low

Now turn to page 42 in your Student Guide.

ANSWERS TO EXERCISE 8

1. b
2. c
3. a
4. a. 700 RPM
   b. 4 pounds of pressure
   c. good
   d. too low
5. c
6. c
7. c
8. a

Now turn to page 44 in your Student Guide.

ANSWERS TO EXERCISE 9

1. a. tank line
   b. flex line, tank line
   c. flexible line that leads to the pump
   d. inlet opening
   e. fuel line at the tank
2. a. 11 inches
   b. air leaks
   c. 9 inches
   d. fuel pump
3. pump
4. a. fuel pump
   b. tank
   c. idle, stop
   d. fuel tank, fuel pump

Now turn to page 47 in your Student Guide.

ANSWERS TO EXERCISE 10

1. a. rated capacity
   b. vehicle weight
2. jack stands
3. no

4. cracked, pinched, broken, stopped up with dirt or trash in the fuel
5. raise the vehicle on a lift
6. a. You should service the fuel filter.
   b. You should measure fuel flow and pressure.

Now turn to page 54 in your Student Guide.

ANSWERS TO EXERCISE 11

1. c
2. yes
3. b
4. a. fuel line
   b. nut
   c. sleeve
   d. union
   e. sleeve
   f. nut
   g. line
   h. line
   i. nut
   j. flare
   k. union
   l. flare
   m. nut
   n. line
   o. line
   p. clamp
   q. hose
   r. clamp
   s. line
5. a. tubing cutter
   b. tubing bender
   c. fine
   d. sleeve, nut
   e. union

Now turn to page 57 in your Student Guide.

ANSWERS TO EXERCISE 12

1. A lighted match or cigarette can ignite the fuel or fumes.
2. Clamp the flexible fuel lines to keep the fuel from dripping. If you keep the fuel from dripping, you will reduce the amount of fuel and fumes in the area. This will make a fuel fire less likely.
3. Same reason as for Question 2.
4. If the light falls and breaks in the middle of a fuel mixture, it could cause an explosion or fire.
5. off, battery
6. Be sure to match threads squarely when connecting fittings.

Now turn to page 65 in your Student Guide.

ANSWERS TO EXERCISE 13

1. Before removing the pump, you should clean the fuel pump and the engine by wiping dirt and grease from the pump and from the engine mounting.
2. a. 2
   b. 1
   c. 5
   d. 3
   e. 4

3. Tap the pump gently with a plastic mallet.
4. As you remove the fuel pump, you should note the position of the rocker arm. You may want to make a written note of this.
5. You should scrape off the old gasket from the engine block and put a new one in its place.

Now turn to page 67 in your Student Guide.

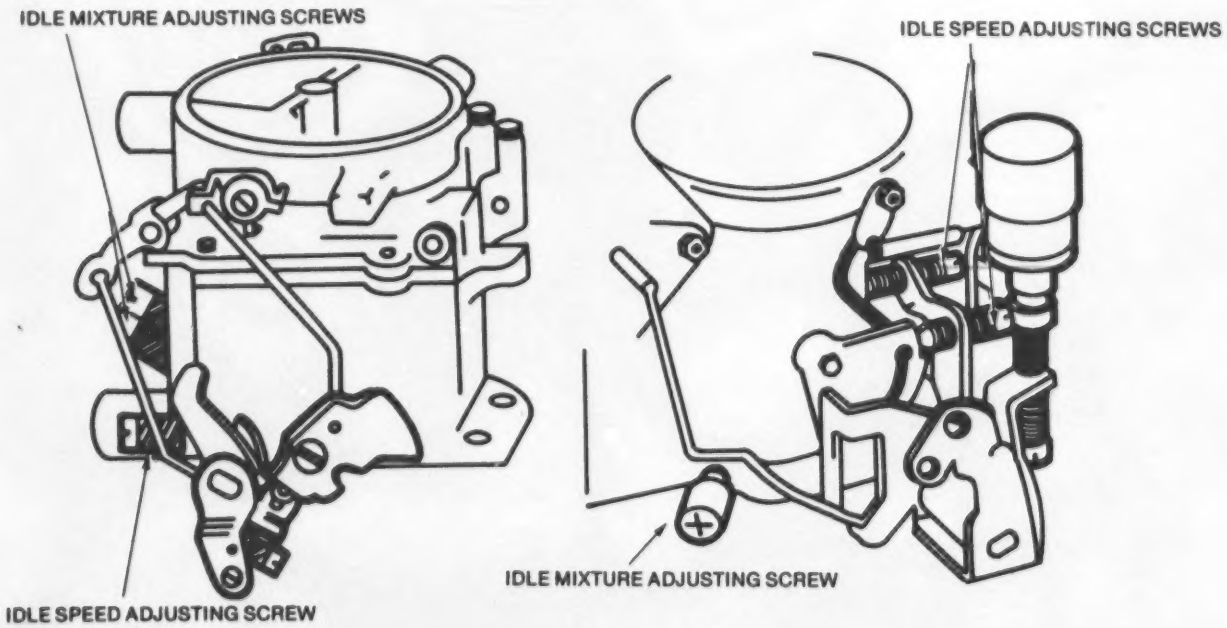
ANSWERS TO EXERCISE 14

1. Be sure that the fuel lines and connections are in good condition.
2. Check to be sure the new fuel pump is the same type as the old one before trying to install it.
3. Coat the new gaskets with sealer.
4. a. 2
   b. 5
   c. 7
   d. 6
   e. 4
   f. 1
   g. 3
5. The mechanical fingers help hold the pushrod up while you are positioning the fuel pump.
6. Install the rocker arm in the same position it was in when you removed it. You will know the position is correct when you can feel the pressure of the rocker arm against the cam.

Now turn to page 69 in your Student Guide.

ANSWERS TO EXERCISE 15

1.



2. b
3. Idle limiters are caps that fit over the idle mixture screws. Idle limiters prevent you from turning mixture screws too far.
4. When the fuel mixture is too rich, the HC and CO levels increase.
5. a
6. b, e, f
7. a, b
8. a, c
9. c
10. a. a technical service manual
    b. a decal in the engine compartment
11. a. base, low, slow, hot
    b. tachometer, speed
    c. disconnected
    d. connected
    e. (1) 800
       (2) 880
       (3) connected

PREPARATION STEPS

STEPS AND SPECIFICATIONS FOR SETTING DWELL AND TIMING

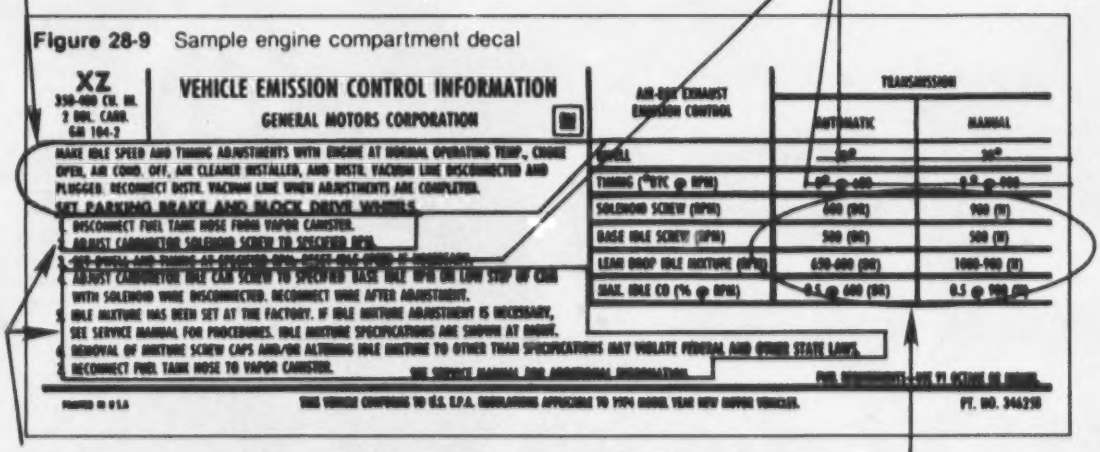

XZ
VEHICLE EMISSION CONTROL INFORMATION
GENERAL MOTORS CORPORATION
AIR-GDC EXHAUST EMISSION CONTROL
TRANSMISSION
AUTOMATIC
MANUAL
DWELL
TIMING (°BTC @ RPM)
SOLENOID SCREW (RPM)
BASE IDLE SCREW (RPM)
LEAN DROP IDLE MIXTURE (RPM)
HAL. IDLE CO (% @ RPM)
DISCONNECT FUEL TANK HOSE FROM VAPOR CANISTER.
ADJUST CARBURETOR SOLENOID SCREW TO SPECIFIED RPM.
ADJUST CARBURETOR IDLE CAM SCREW TO SPECIFIED BASE IDLE RPM ON LOW STEP OF CAM WITH SOLENOID WIRE DISCONNECTED. RECONNECT WIRE AFTER ADJUSTMENT.
IDLE MIXTURE HAS BEEN SET AT THE FACTORY. IF IDLE MIXTURE ADJUSTMENT IS NECESSARY, SEE SERVICE MANUAL FOR PROCEDURES. IDLE MIXTURE SPECIFICATIONS ARE SHOWN AT RIGHT.
RECONNECT FUEL TANK HOSE TO VAPOR CANISTER.
PT. NO. 346218

Figure 28-9 Sample engine compartment decal

STEPS FOR SETTING IDLE SPEED AND MIXTURE

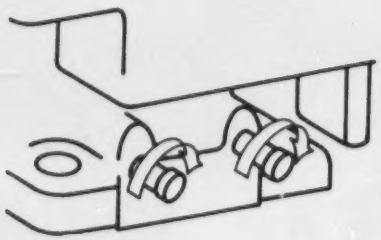
SPECIFICATIONS FOR IDLE SPEED AND MIXTURE

Courtesy General Motors.

Now turn to page 82 in your Student Guide.

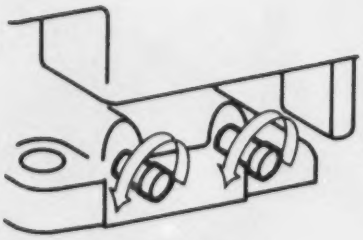
ANSWERS TO EXERCISE 16

1.



(LEAN)

2.



(RICH)

3. d
4. reconnect
5. higher
6. c
7. a. 4, 6
   b. 3, 7
   c. 2, 5
   d. 1
   e. 8
   f. 9
8. disconnect the solenoid wire

9. a. normal operating
b. remove
c. air cleaner vacuum hose, intake manifold
d. fitting
e. parking brake
f. block
g. open
h. off
i. vapor canister, EGR valve
j. fittings

10. leave the distributor vacuum hose connected

11. b

12. *D*, or drive

13. *N*, or neutral

14. idle stop solenoid screw

15. a. 800
b. 650

16. carburetor idle screw

17. a. 600
b. 500

18. a. normal operating
b. vapor canister hose, vapor canister
c. plug, distributor vacuum, EGR valve vacuum
d. OFF
e. air cleaner
f. parking brake
g. block
h. *D*, or drive
i. *N*, or neutral

19. a

20. b

21. a. out
b. (1) don't
(2) do
(3) 80, 730, 880
c. 80, lean
(1) 800
(2) 650

Now turn to page 87 in your Student Guide.

ANSWERS TO EXERCISE 17

1. valve
2. shaft
3. piston
4. thermostatic coil, warm
5. linkage
6. vacuum break, piston operated
7. c choke valve
   d vacuum break
   e choke rod
   a coil
   b vacuum-break rod
8. d thermostatic coil
   c screen
   b heat stove line
   e choke valve
   a choke piston
   f manifold vacuum

Now turn to page 101 in your Student Guide.

ANSWERS TO EXERCISE 18

1. b choke lever
   a thermostatic coil
   d choke piston
   c choke shaft
   e gasket
   f plate
2. a air cleaner
   b choke thermostat cover
   c piston, linkage
3. coil, cover
4. a piston, linkage
   b butterfly, shaft
   c unloader
   d screen
   e cleaning solvent
   f air hose
5. b
6. a
7. b
8. c
9. bend, bending
10. remeasure, piston
11. 2 Install the plate and thermostat cover gasket.
    1 Be sure the choke screen is installed.

5 Rotate the cover assembly to the index position.
4 Install the cover attaching screws.
3 Install the thermostat cover and coil assembly.

12.

b	1NL	e	1R
a	2L	c	INDEX
d	2NR	a	2NL
b	1L	d	2R

13. a, b, c, d

Now turn to page 107 in your Student Guide.

ANSWERS TO EXERCISE 19

1. d

2. c, d

3. b

4. c

5. b

6. c

7. b

8. carburetor model, technical service manual

9. c, d

10. a, b, c, d, e, f

11. a, b, c, d

Now turn to page 115 in your Student Guide.

ANSWERS TO EXERCISE 20

1. a, b, d, e, f, g, h

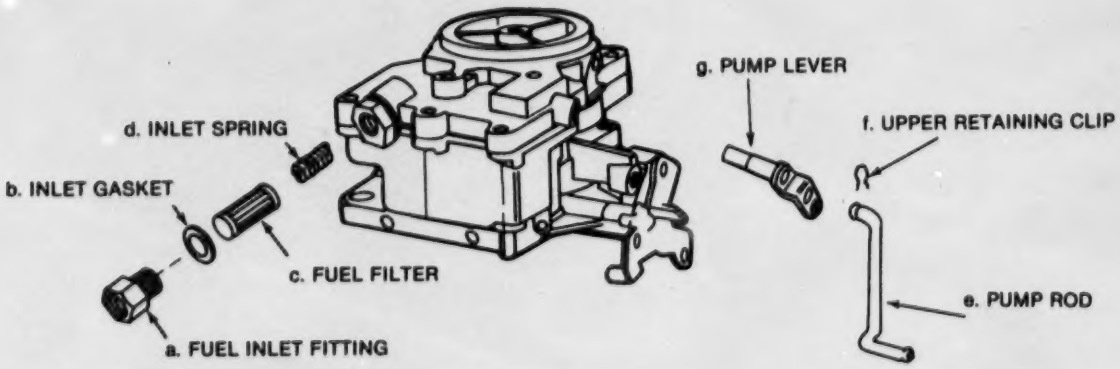
2.
1. e
2. a
3. f
4. b
5. h
6. d
7. i
8. j
9. c
10. g

3.
1. g
2. d
3. a
4. f
5. h
6. b
7. i
8. e
9. c

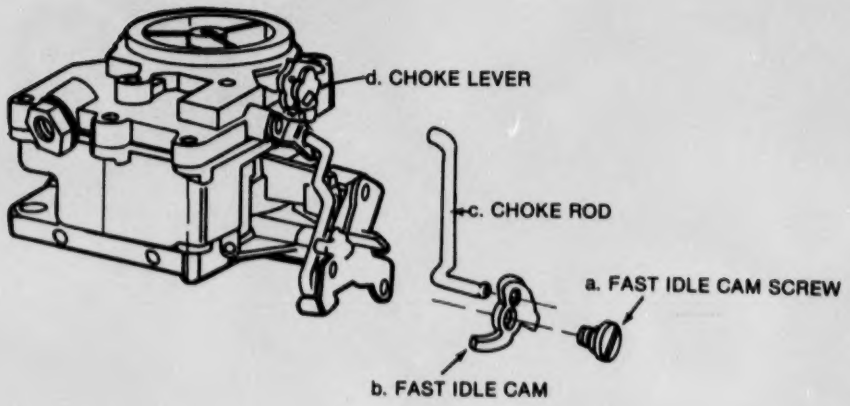
Now turn to page 124 in your Student Guide.

ANSWERS TO EXERCISE 21

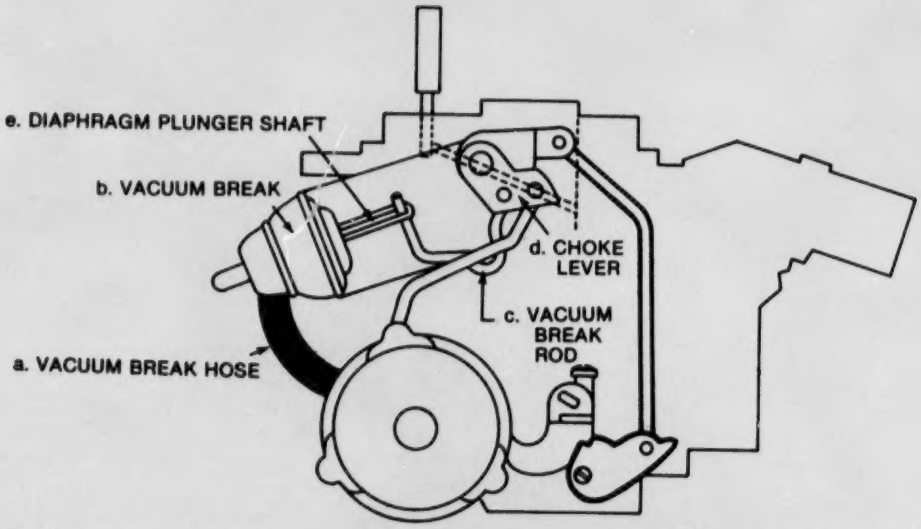
1. One with plenty of air in it. (It's important to have lots of air when you're working around fumes or fuel.)
2. yes
3. Clamp
4. Plug
5. If you dropped an extension light into a pool of fuel, it could break and ignite the fuel, causing a fire or explosion.
6. You could cover it with a hat.
7. flare-nut wrench
8. match, squarely
9. a. rubber gloves
   b. a rubber apron
   c. eye protection (or goggles)
   d. carefully following safety cautions listed
10. Place masking tape or rags over the intake manifold.
11. the carburetor has been removed
12. a. 3
    b. 1
    c. 4
    d. 5
    e. 2
13.



14.

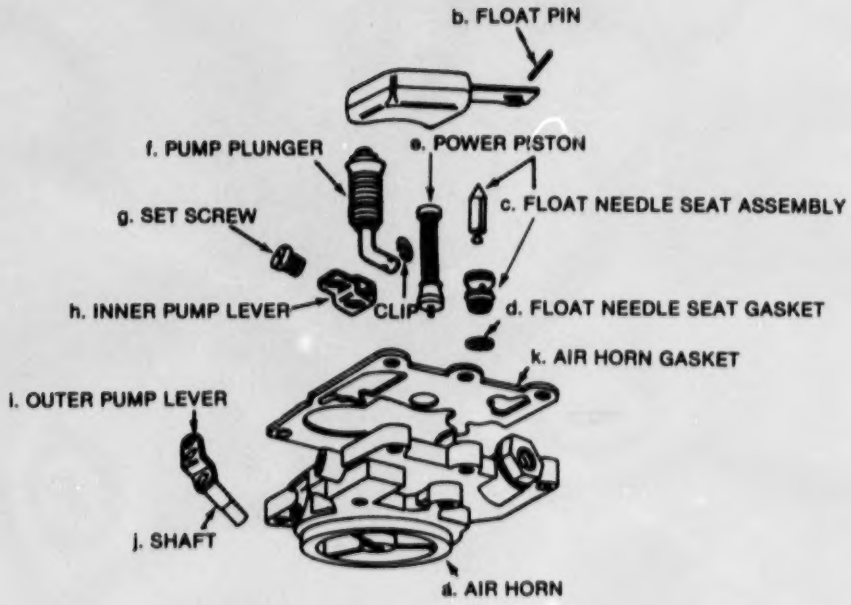


15.



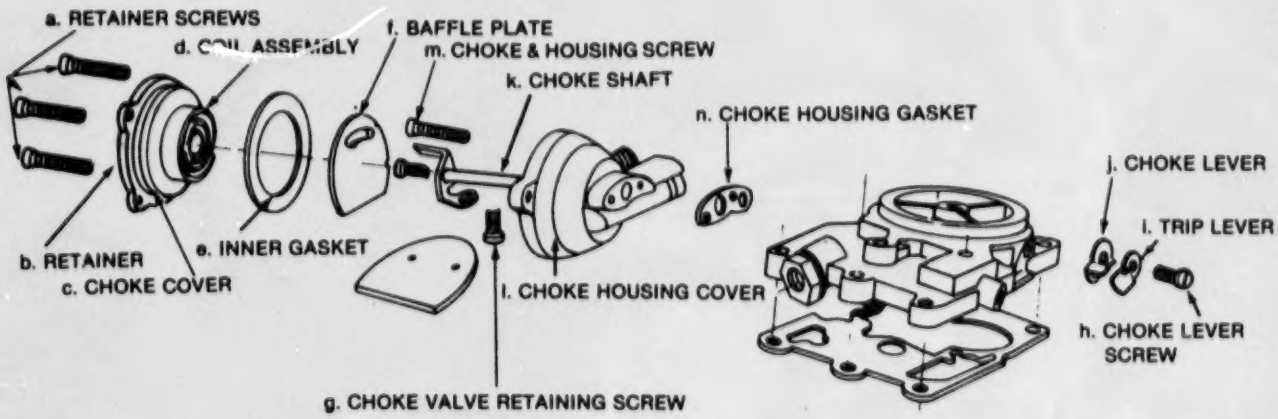
16. Place the carburetor air horn parts in a separate storage pan.

17.



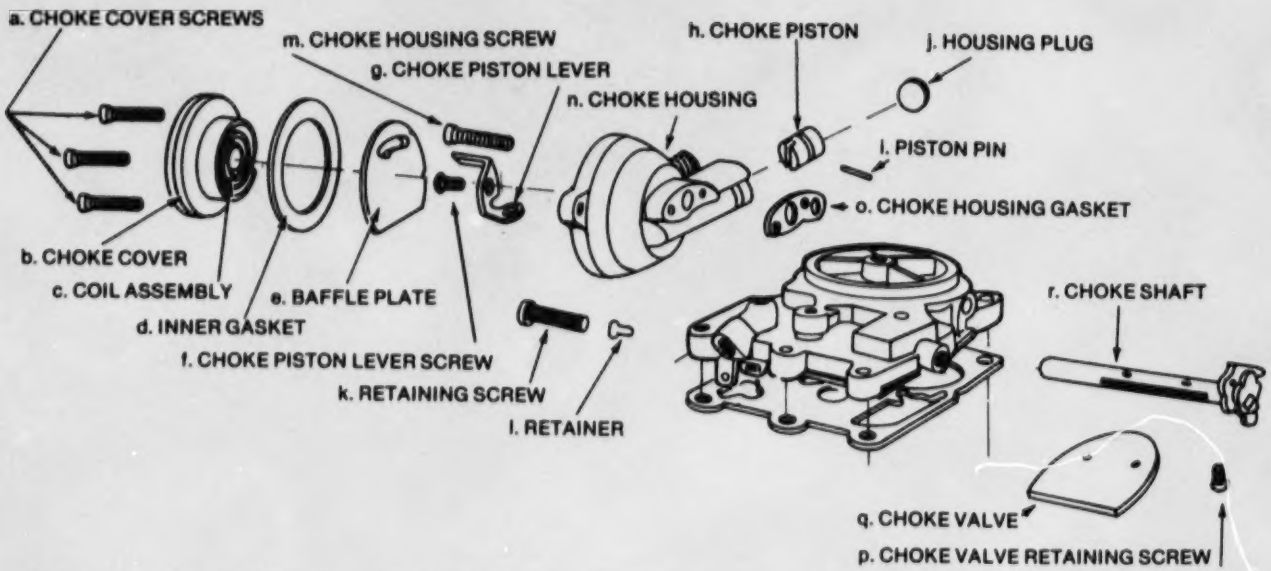
18. Place the float assembly parts in a separate storage pan.

19.



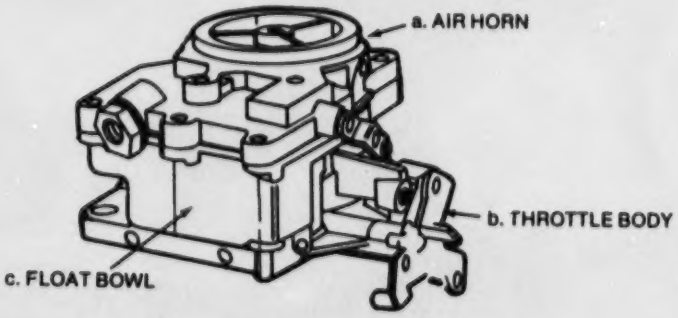
20. attached to the shaft with a screw

21.

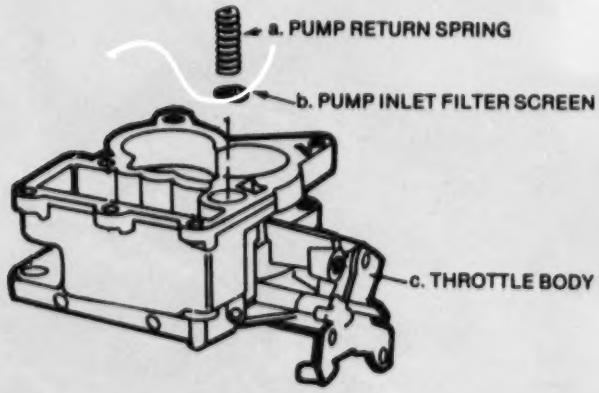


22. Place the choke assembly parts in a separate storage pan.

23.

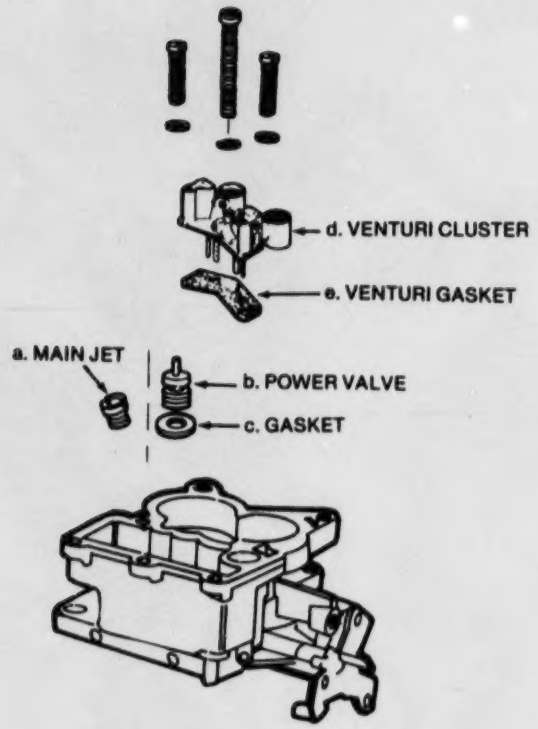


24.

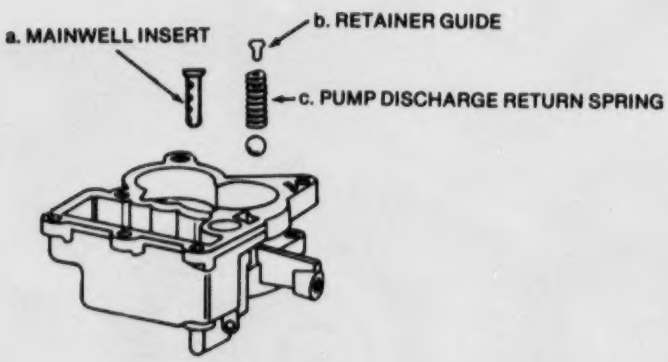


25. Invert the float bowl and shake the intake check ball into your hand.

26.

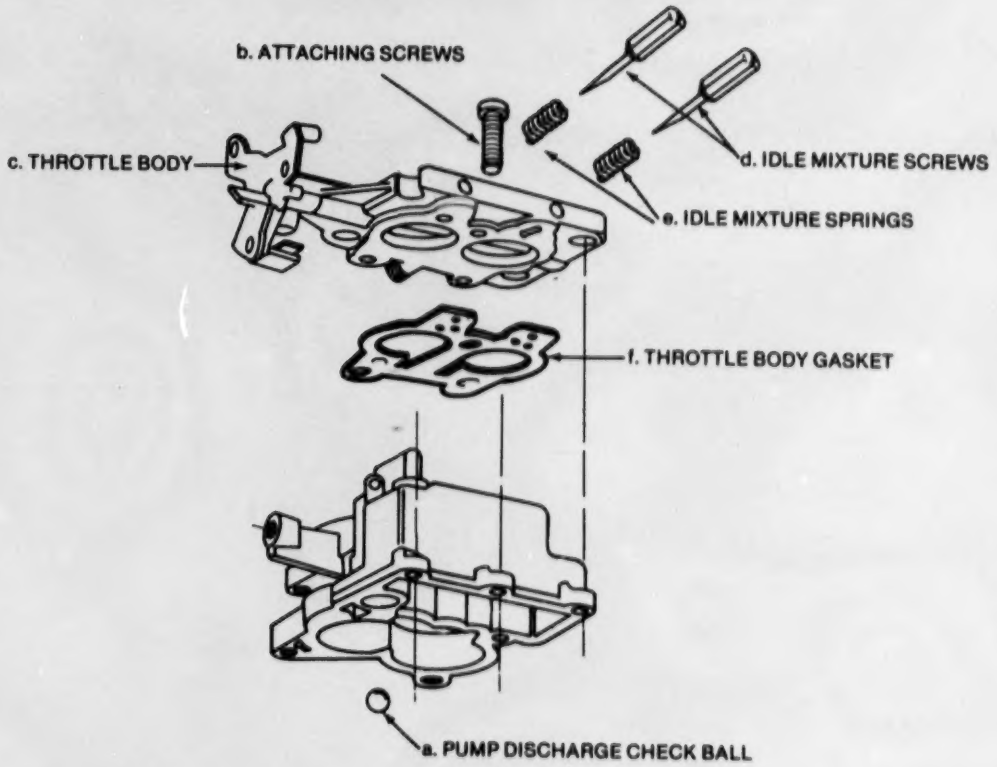

d. VENTURI CLUSTER
e. VENTURI GASKET
a. MAIN JET
b. POWER VALVE
c. GASKET

27.


a. MAINWELL INSERT
b. RETAINER GUIDE
c. PUMP DISCHARGE RETURN SPRING

132

28.



29. Place each group of parts in a separate storage pan.

30. a. 1
b. 2
c. 3
d. 4
e. 5
f. 6

Now turn to page 137 in your Student Guide.

ANSWERS TO EXERCISE 22

1. k, l

2. at least half an hour

3. wire basket, basket, cover

4. Blow out jets, nozzles, and other passages with compressed air. Use a flashlight to be sure they are clean.

5. Drills or wires could enlarge the openings of jets and nozzles. Never clean jets or nozzles with drills or wires.

6. cloth

7. a. 10
b. replace

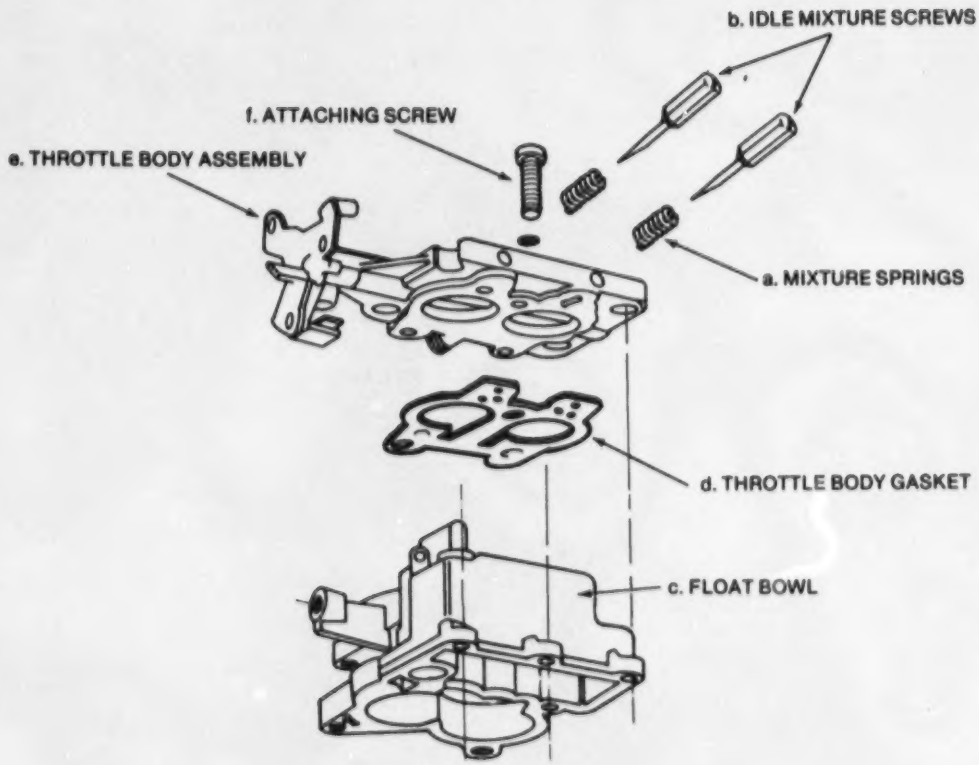
8. a, b, c, d, e, f, g

9. float
10. linkage arms

Now turn to page 139 in your Student Guide.

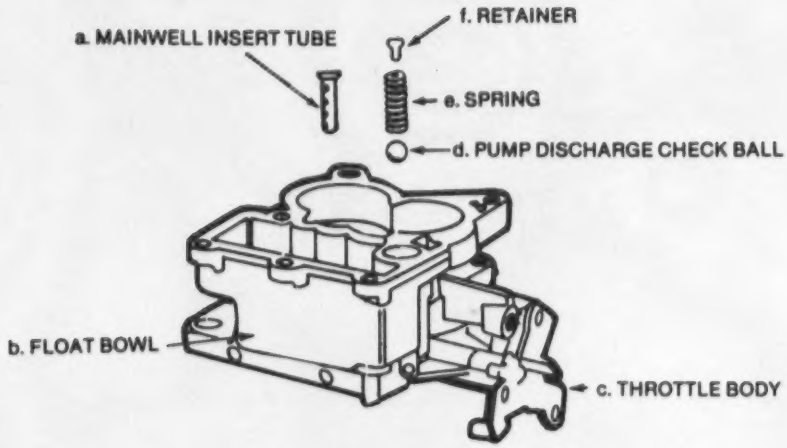
ANSWERS TO EXERCISE 23

1. b, c, e, f, g, h
2. fuel filter
3.



4. a. springs, screws, screws
   b. two
   c. float bowl, gasket
   d. gasket
   e. attaching screws

5.



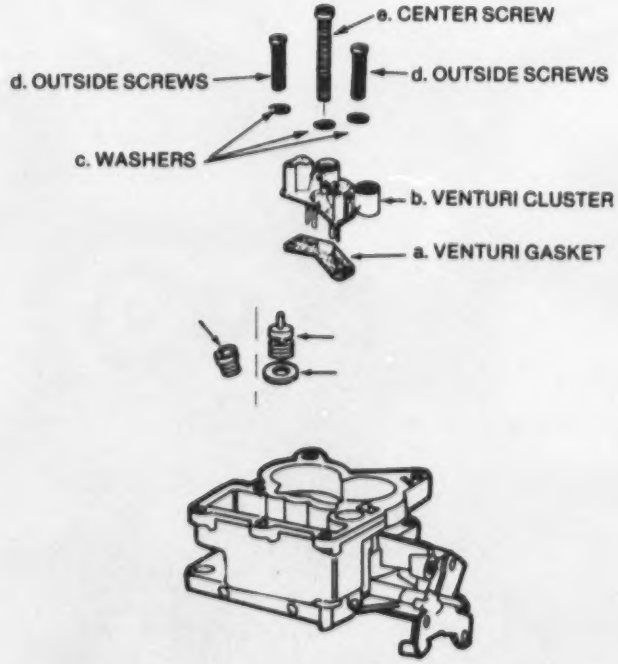
6. no

7. 1. pump discharge check ball
   2. spring
   3. T-shaped retainer

8. The pump discharge check ball is made of steel. The inlet check ball is made of aluminum.

9. retainer

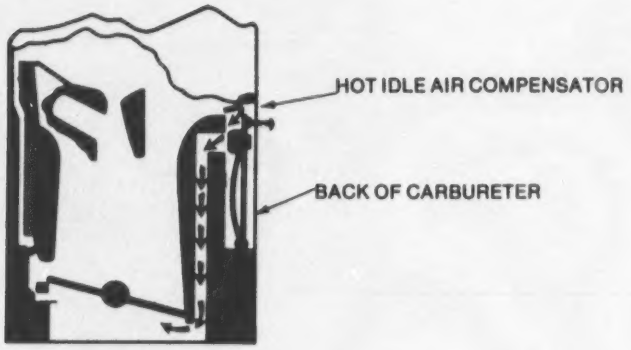
10.



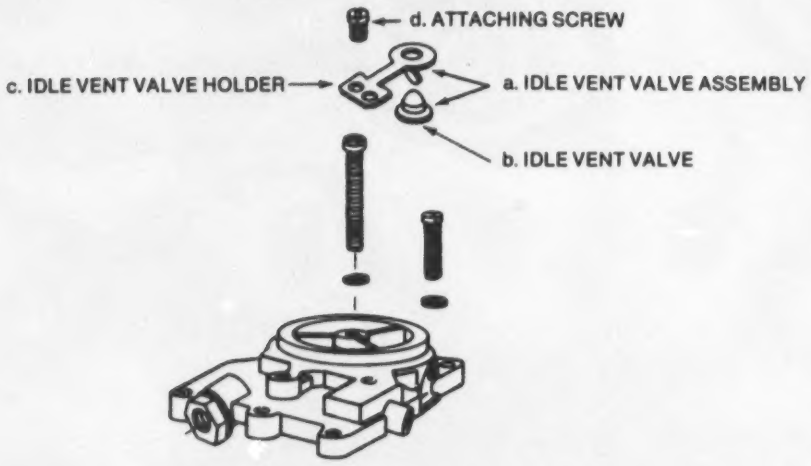
11. center screw

135

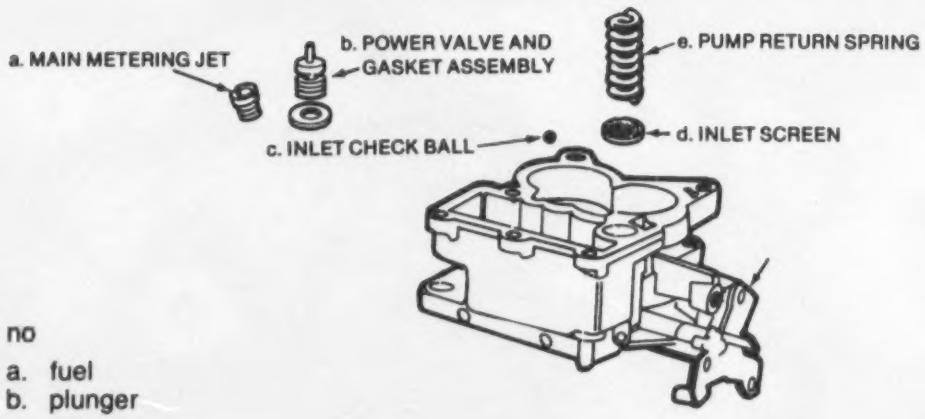
12.



13.



14.



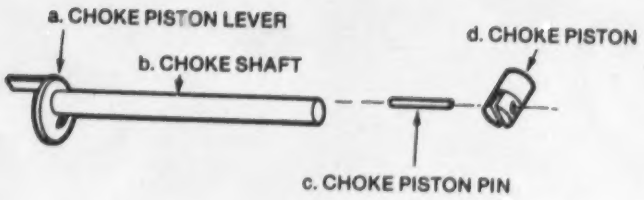
15. no

16. a. fuel
    b. plunger
    c. pump
    d. jet, bores

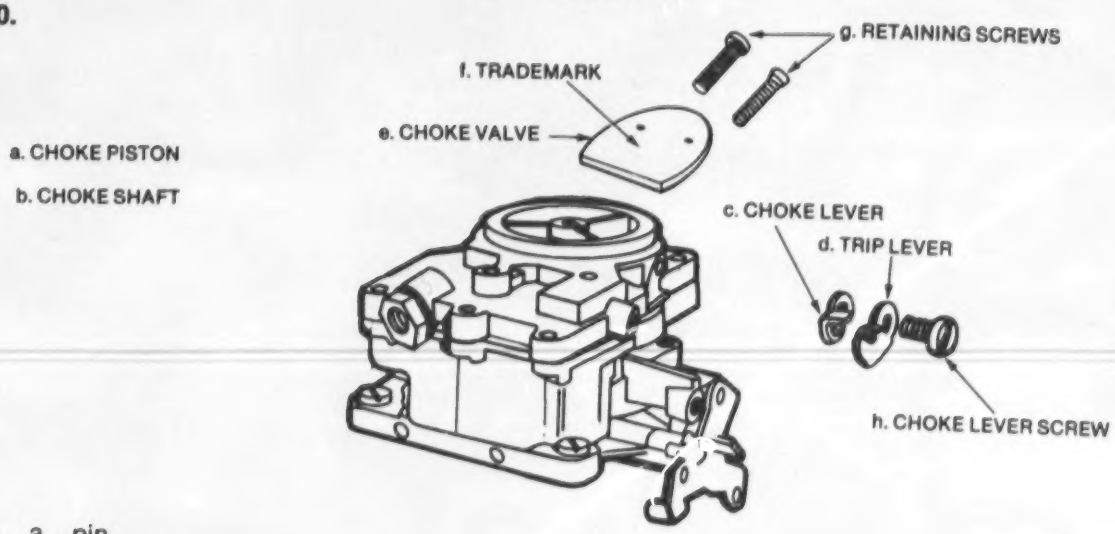
17. Soak the accelerator pump leather in gasoline for about 30 minutes.

18. 1. choke housing gasket
    2. choke housing
    3. attaching screws

19.



20.



21.
a. pin
b. choke shaft
c. choke housing
d. screw
e. choke shaft
f. up
g. retaining screws
h. centered

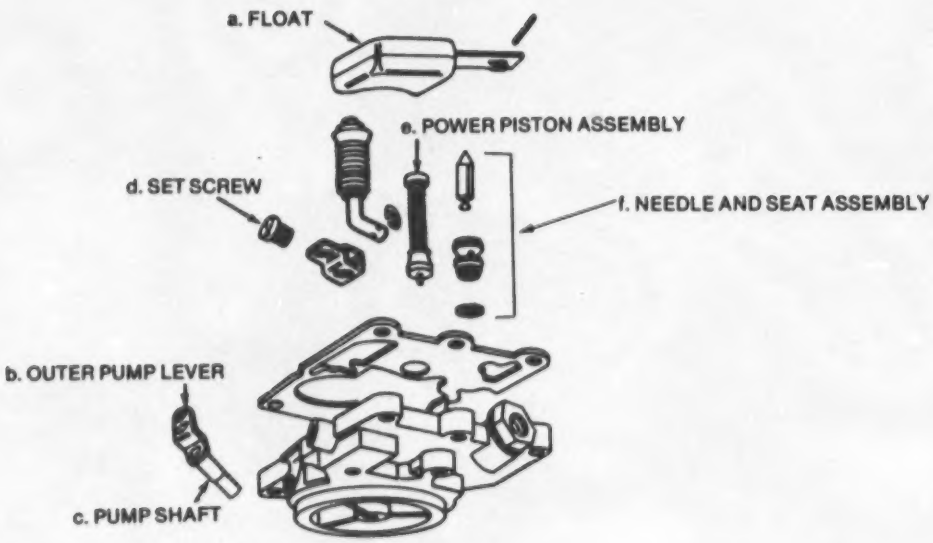
22.

a. CHOKE LEVER
b. TRIP LEVER
c. CHOKE SHAFT
d. CHOKE PISTON LEVER
e. CHOKE PISTON
f. CHOKE PISTON PIN
g. ATTACHING SCREW

23.
a. choke shaft
b. pin
c. screw
d. choke shaft
e. up

24. a. closed
b. .020
c. .020
d. stake
e. valve

25.



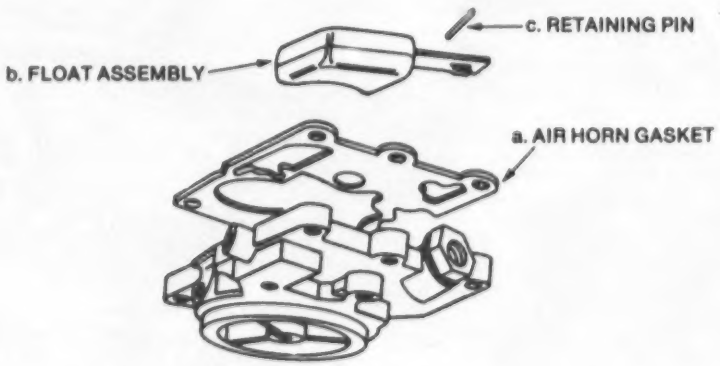
26. a. Lubricate the pump shaft with light oil.
b. Place a plastic washer, if there is one, around the pump shaft arm.

27. float

28. Stake the power piston in the air horn.

29. wide screwdriver

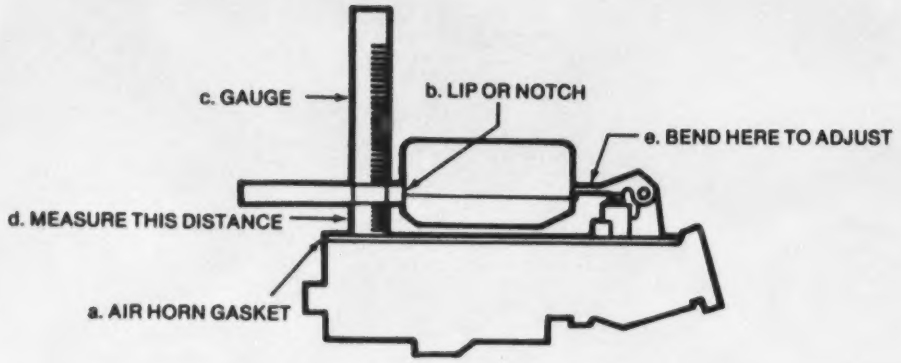
30.



31. retaining pin

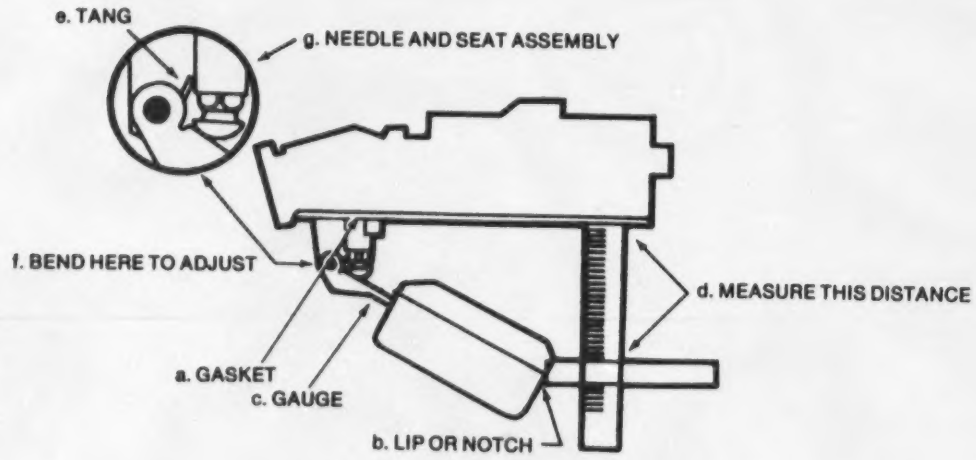
32. a. float lever
b. gauge, gasket, lip, notch

33.



34. a. float drop
b. gauge, gasket, lip, notch

35.

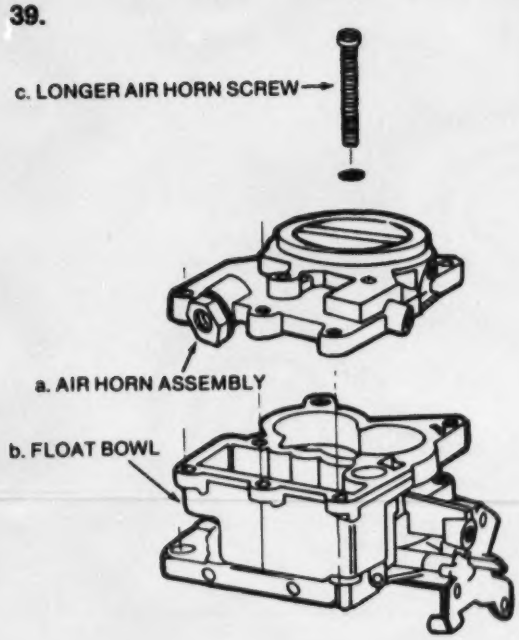


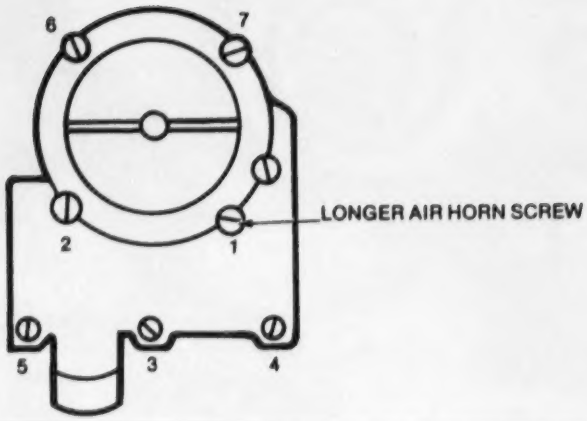
36. b

37. a

38. b, d

39.

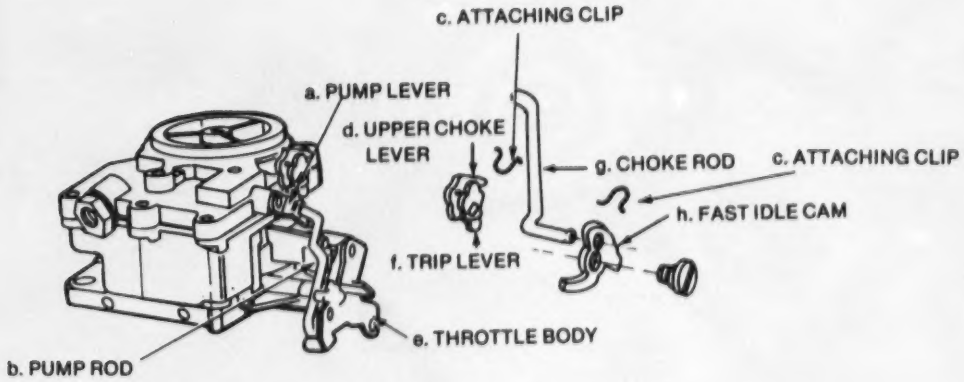




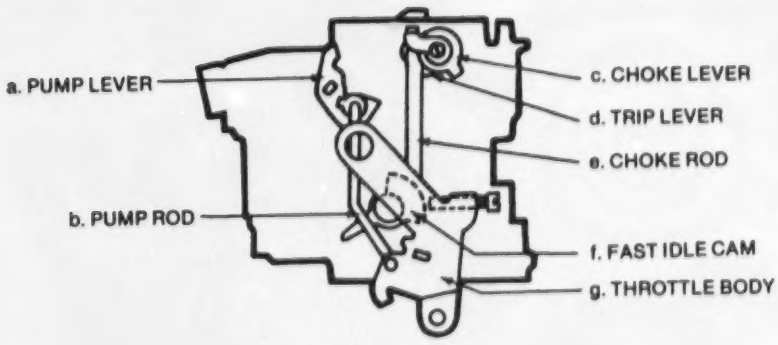
Adapted from *Delco Carburetor Parts Service Manual.*
©1973 General Motors Corporation.

40. a, b, c

41.



42.



43. 1. pump rod
    2. choke rod
    3. fast idle cam
44. a. bracket
    b. gasket
    c. specifications in a technical service manual
45. a. closed
    b. ring, pump connector rod, specifications in a technical service manual
    c. bend
46. b, c, d, e, f

Now turn to page 150 in your Student Guide.

ANSWERS TO EXERCISE 24

1. heat riser
2. exhaust manifold, exhaust pipe
3. a. valve
   b. counterweight
   c. thermostatic coil spring
   d. valve shaft
   e. anti-rattle spring
4. c
5. a
6. b
7. accelerate, counterweight
8. counterweight
9. exhaust gases, valve shaft
10. anti-rattle spring

Now turn to page 158 in your Student Guide.

ANSWERS TO EXERCISE 25

1. b
2. b
3. soft hammer
4. exhaust gases, replaced
5. a. penetrating oil
   b. 6-point
   c. exhaust pipe
   d. gasket
   e. up
   f. brass
6. a. counterweight
   b. lock, counterweight
   c. thermostatic spring, anti-rattle spring
   d. shaft, butterfly or valve

141

Now turn to page 163 in your Student Guide.